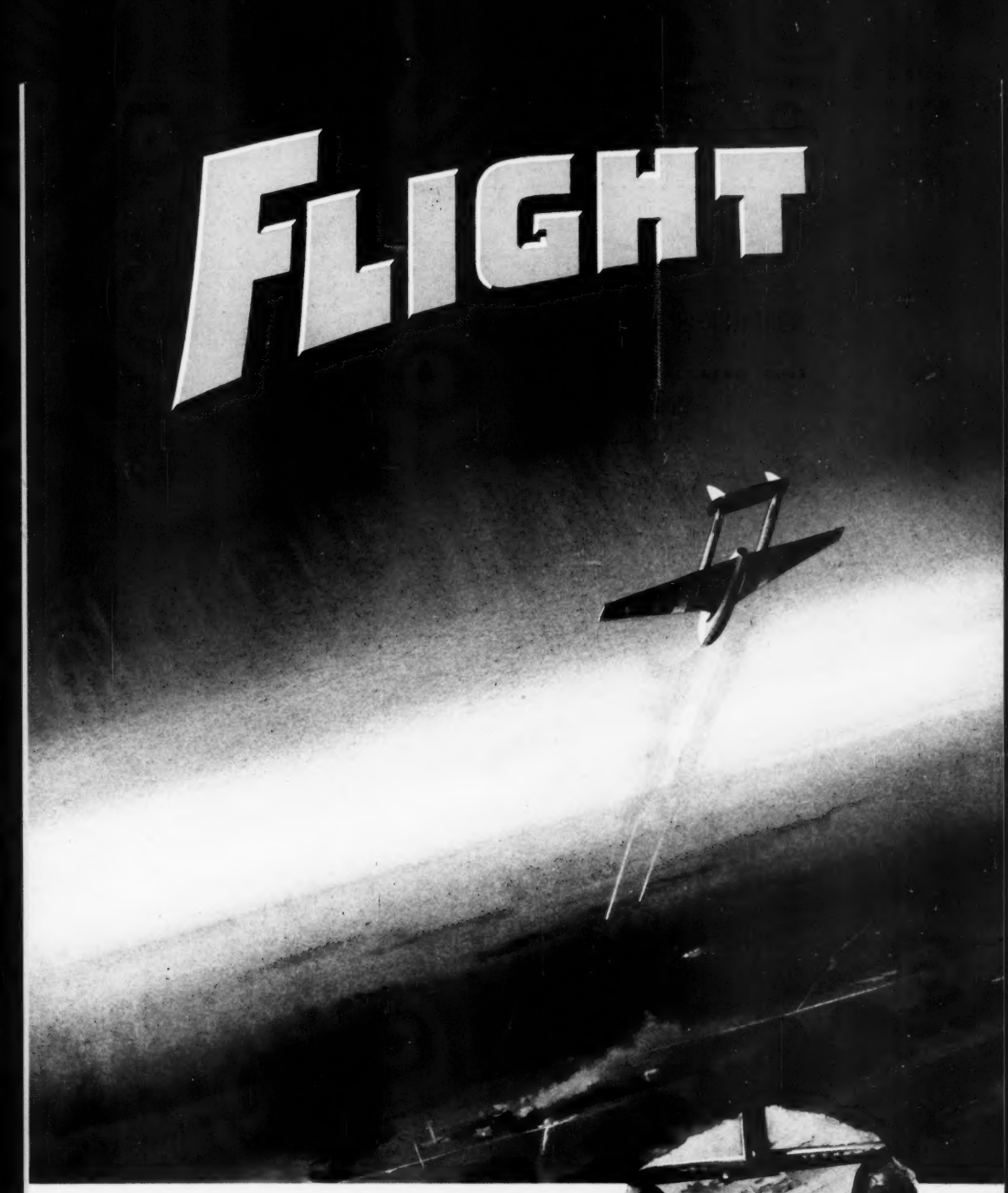
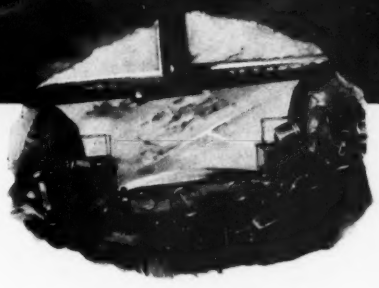
FLIGHT

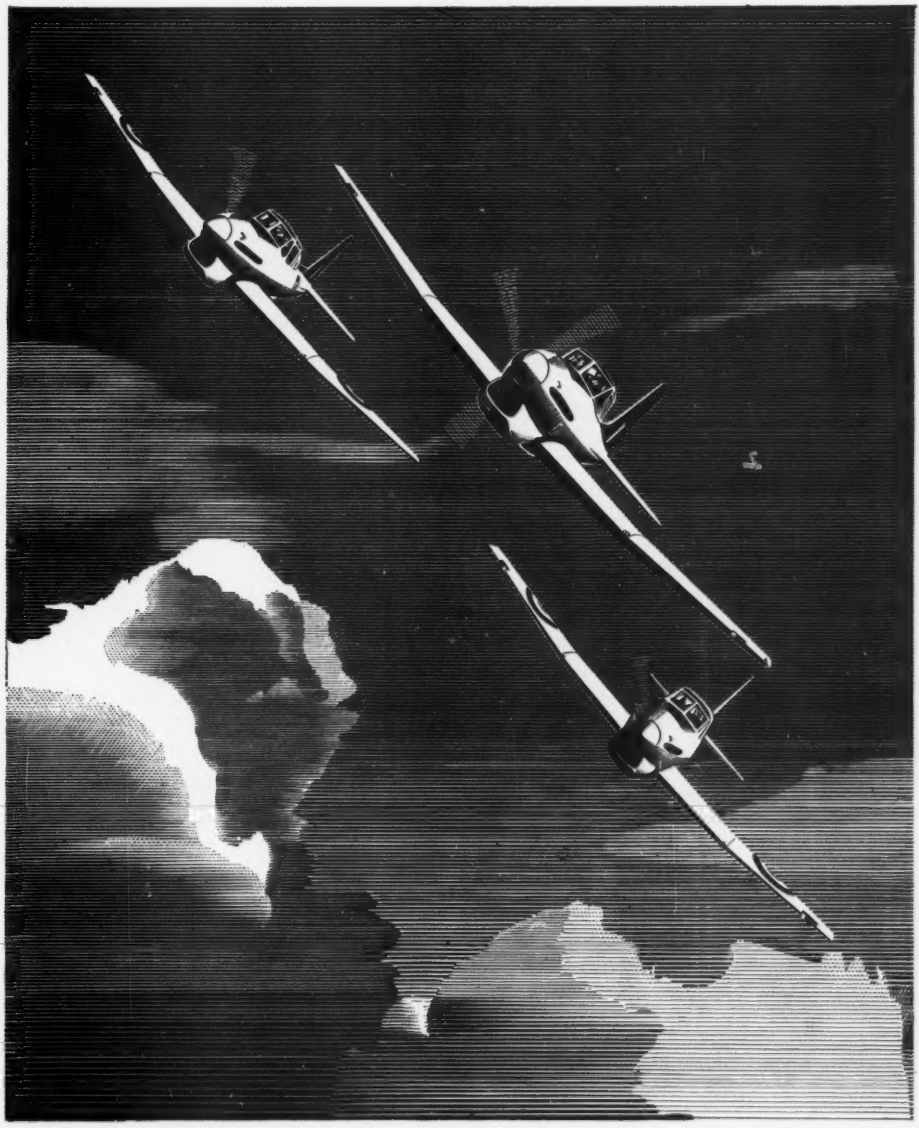


Full fighter performance in the training role. A docile, sensitive aeroplane with complete duplication of flying and weapon controls and with side-by-side seating; the finest configuration for pilot and pupil.



DE HAVILLAND VAMPIRE TRAINER

The de Havilland
COMETS
are fitted for all
electrical services with
BI Callender's
"PREN" AIRCRAFT CABLES
BRITISH INSULATED CALLENDER'S CABLES LIMITED
NORFOLK HOUSE, NORFOLK STREET, LONDON, W.C.2



BALLIOL T.2. ADVANCED TRAINER
ROLLS-ROYCE MERLIN 35 ENGINE.

IN PRODUCTION FOR THE R.A.F.

BOULTON PAUL AIRCRAFT LTD.
WOLVERHAMPTON, ENGLAND

BPA

A

Do you know your airfields?

16

Recognise this airfield? It's No. 16 in this series of puzzle photographs. You'll find the answer below on the right ★

Fly to any one of the twenty-five British Aerodromes where Shell and BP Aviation Service operates — you can be sure of a friendly welcome from the crews of the familiar Aircraft Servicing Vehicles. Whether your aircraft has a cocktail bar aboard or simply a thermos stowed under the pilot's seat, you will always get the same quick, careful attention from these crews — always on duty every day throughout the year.

Shell and BP Aviation Service

Shell-Mex and B.P. Ltd., Shell-Mex House, Strand, W.C.2.
Distributors in the U.K. for the
Shell and Anglo-Iranian Oil Groups.

★ Teaton

What other vehicle...

. . . perched on a mountain top with a bullet through the engine can have a new engine flown in —replaced by two men—and fly back to base (45 miles away) in under 3 hours operation.

only

WESTLAND *HELICOPTERS*

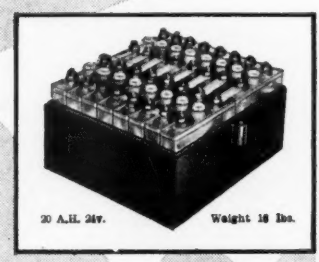
Give you the answer!

WESTLAND AIRCRAFT LIMITED, YEOVIL

NEARLY HALF A MILLION HELICOPTER FLYING HOURS SUPPORT WESTLAND'S LEAD

THE PAY LOAD IS UP . . .

. . . thanks to Venner Lightweight Accumulators



20 A.H. 24v. Weight 16 lbs.

These revolutionary new Alkaline storage batteries are ideally suited for saving both WEIGHT and SPACE in aircraft—the vital factors affecting higher pay loads.

Toughness, long life and efficient performance are but highlights among their many outstanding features.

The services of our technical staff are at your disposal in investigating the operational advantages of these accumulators.

Approximately ***one third the weight*** and ***half the size*** of other accumulators of similar capacity. Shockproof — completely unspillable — fully insulated — operates in any position — unharmed by accidental overloads. Can be left charged, semi-charged or discharged without harm.

FOR DETAILS OF ALL TYPES WRITE FOR LEAFLET V.A. 006/F

Not at present available for engine starting.

VENNER

ACCUMULATORS LTD *Telephone :* MALden 2442 (*6 lines*)

KINGSTON BY-PASS, NEW MALDEN, SURREY.

STEEL STRIP

SHEETS AND SECTIONS

TO A.I.D. SPECIFICATIONS

HABERSHON

ROTHERHAM

Britain's

LARGEST FREIGHTER

built for the

MINISTRY OF SUPPLY

by **BLACKBURN & GENERAL AIRCRAFT LIMITED**

For Twin Wheel Aircraft

"SKYHI"

SPECIALLY DESIGNED HYDRAULIC

JACKS

of narrow width that easily go between the twin nose wheels.

Ball or Flat Head as required.

Model S.2061.
38,000 lbs. capacity.
11" closed height.
11" Hydraulic Lift.
Overall width. 5".

Model S.869.
18,000 lbs. capacity.
6" closed height.
6½" Hydraulic Lift.
Overall width. 5".

Please write for 16 pp. new Aircraft Jack booklet

SKYHI LIMITED "SKYHI" WORKS,
WORTON ROAD, ISLEWORTH, MIDDX.
Telegrams: SKYHI, ISLEWORTH, LONDON. Telephone: HOUNSLOW 2211/2/3

Publication early December

JANE'S all the world's AIRCRAFT

1951-52 Edition

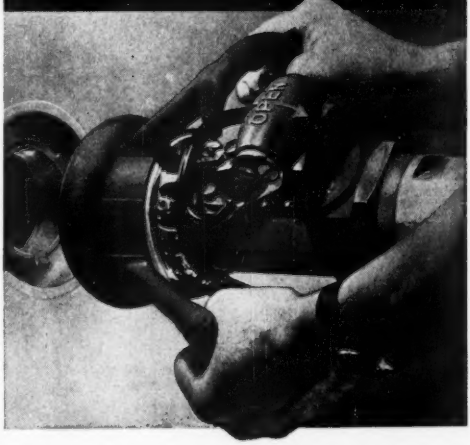
Edited by LEONARD BRIDGMAN

A complete annual record of aeronautical progress

£4 : 4 : 0 net.

SAMPSON LOW, 25 GILBERT ST. W.1.

Pressure Refuelling



More time in the Air . . .
Less time on the ground . . . with the

F.R. HIGH SPEED SYSTEM

FLIGHT REFUELLING LIMITED.
Tarrant Rushton Airfield, Blandford, Dorset. Tel. Blandford 501 Grams. Refuelling.

An Announcement . . .

DUREX ABRASIVES LTD wish to announce that as from June 14th, 1951, the name of the Company has been changed and is now the MINNESOTA MINING & MANUFACTURING COMPANY LTD.

Identification will be as before, except that the words "Scotch Boy" will be used instead of "Durex" as a prefix to the name of the material, *e.g.*, "Scotch Boy Tapes" instead of "Durex Tapes"

Existing high standards in the quality of the products will be maintained, the change is in name only.

'SCOTCH BOY' *Masking* TAPE

"SCOTCH BOY" Masking Tape is supplied in rolls 72 yds. long and in a variety of widths

DISTRIBUTIVE ARRANGEMENTS UNCHANGED

Manufactured by:—

MINNESOTA MINING & MANUFACTURING COMPANY LIMITED

ARDEN ROAD · ADDERLEY PARK · BIRMINGHAM, 8

STRIKING

Large bomb bay carries attack weapons

STRIKING DOWN

Double-fold wings are power-folded

FAIREY GANNET

(FAIREY 17)

ARMSTRONG SIDDELEY DOUBLE MAMBA

TWIN-ENGINED • ANTI-SUBMARINE • CARRIER-OPERATED

CHOSEN FOR SERVICE IN THE ROYAL NAVY

THE FAIREY AVIATION COMPANY LIMITED, HAYES, MIDDLESEX

FLIGHT
and
AIRCRAFT ENGINEER

First Aeronautical Weekly in the World

Founded 1909

No. 2233 Vol. LX. FRIDAY, 9 NOVEMBER 1951

EDITOR
MAURICE A. SMITH, D.F.C.

ASSISTANT EDITOR
H. F. KING, M.B.E.

TECHNICAL EDITOR
C. B. BAILEY-WATSON, B.A.

ART EDITOR
JOHN YOXALL

Editorial, Advertising and Publishing Offices:

DORSET HOUSE,
STAMFORD STREET,
LONDON, S.E.1

Telegrams, Flightpres, Sedist, London.
Telephone, Waterloo 3333 (60 lines).

Branch Offices:

COVENTRY
8-10, Corporation Street.
Telegrams, Autocar, Coventry.
Telephone, Coventry 5210.

BIRMINGHAM, 2
King Edward House,
New Street.
Telegrams, Autopress, Birmingham.
Telephone, Midland 7191 (7 lines).

MANCHESTER, 3
260, Deansgate.
Telegrams, Iliffe, Manchester.
Telephone, Blackfriars 4412 (3 lines).
Deansgate 3595 (2 lines).

GLASGOW, C.2.
26b, Renfield Street.
Telegrams, Iliffe, Glasgow.
Telephone, Central 1265 (2 lines).

SUBSCRIPTION RATES
Home and Overseas: Twelve months £3 3s. 10d. U.S.A. and Canada, $10.00
BY AIR: To Canada and U.S.A., six months, $16.

IN THIS ISSUE:

Pushing the Boat Out - 582
Proteus-Hermes - - - 588
Manpower v Air Power - 589
Around Iraqi Airways - 590
Seeking St. Auban's Standing Wave - - - 593
Power-operated Controls 597
Answer to the Pilot's Prayer - - - - - - 601
Low-aspect-ratio Aerodynamics . - - 607

Paved with Good Intentions

REGULAR readers will know that for more than two years *Flight* has hammered away with almost monotonous regularity at the subject of production and, more particularly in the earlier part of that period, the absence of production orders for modern fighters for day and night duties. Now, at last, orders have been placed not only for fighters, but also for a four-jet bomber which has in the meantime emerged in prototype form; yet the Royal Air Force is still far from receiving a high-performance swept-wing fighter in its squadrons, and the Navy's latest jet equipment is represented by one squadron of straight-wing Attackers.

At the time of the late Government's lamentable cut-back on even the trickle of aircraft production then apparent, we regretted ("Perilous Policy," February 16th, 1950) not only the action itself but the further run-down and reduction in the industry's productive capacity which it involved. As everyone must now know, the country has been left in a very serious position, lacking a flow of modern aircraft to pass into squadron service and, worse still, with a seriously depleted industry that has so far been unable to expand at anything like the rate to meet the belated production orders of recent months.

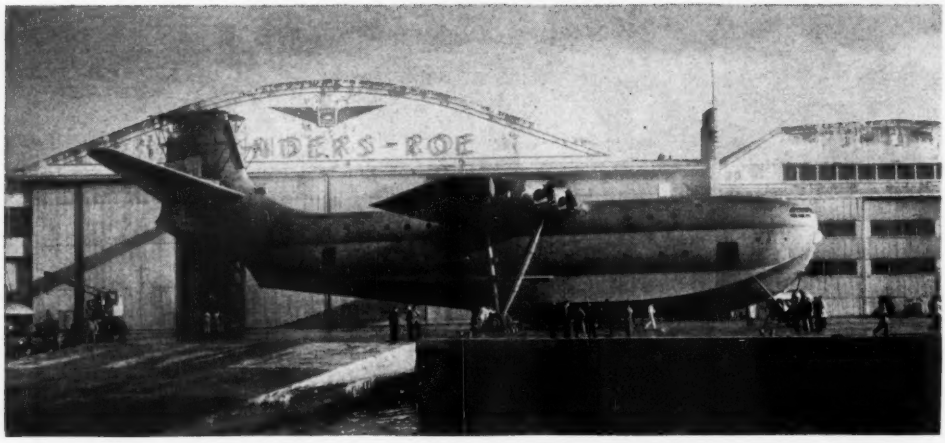
Air Chief Marshal Sir Guy Garrod's Air League statement on production capacity and manpower (reported on page 589) is most timely. That a real national effort is needed, in action and not in words, is vividly emphasized by the Air League's reminder that, whereas the aircraft industry requires an average labour intake of 7,500 workers a month to meet its rearmament commitments, the rate actually achieved (from April to July this year) was only 850. (In a discussion of Sir Guy's statement, incidentally, it was suggested that his words should be directed to the new Government and the Air Council just as much as to the general public.)

At election time somebody remarked that there were many who thought they could vote themselves into better living conditions without taking any personal action. That observation is one which could be applied with equal truth to the production of aircraft. There is little use in placing production orders unless the means are provided whereby they can be executed.

Giving it Away

WHAT to British eyes seems to be an inconsistency in the attitude of Americans towards national security is that whereas on the one hand they resort to such organizations as the Un-American Activities Committee, on the other they seem to take little notice of precautions of the kind that we accept as a matter of course. An example is to be found in a recent issue of a contemporary U.S. journal in which the location, factory area and total employment figures for all the leading American airframe and engine contractors are tabulated in detail. Whether these revealing figures have been collected independently by the magazine or obtained from official sources we do not know, but with their aid the magnitude of the country's production potential can be gauged with some accuracy. Of particular interest are the totals of employees of companies manufacturing for the Services, and of factory area in square feet; these figures are, respectively, 371,000 and 88,798,000. Again, the five major constructors—Boeing, Convair, Douglas, Lockheed and North American—have total employment figures, in thousands, of 50, 49, 38, 31 and 31; and their factory areas, in millions of square feet, are 8·691, 7·629, 8·513, 15·424, 7·219. Though neither vast nor approaching wartime capacities, these figures are nevertheless formidable, and their publication might, of course, be held to be justified as an indication of impressive and deterrent strength.

Comparable figures in this country are known only to a few persons concerned. The manpower total for the whole British aircraft industry, a round figure we are permitted to quote, is now about 162,000. It can also be mentioned that the average working week for a man over 21 was, at the time of a recent survey, 41.8 hours, and his average pay 3s. 9d. per hour. It may also be added that this is 5½d. per hour less than for workers producing motor cars. Such statistics, we imagine, while they provide food for thought here, are hardly like to overheat official slide-rules in Moscow.



For the first time the sun shines on the Princess—clear of her hangar and scaffolding—revealing a form both majestic and classic. Stage one of the movement plan has been completed, and here the rudder and fin will be added before the tail is swung out over the slipway in a week or two's time.

PUSHING THE BOAT OUT

The First Princess Flying Boat enters on the Last Stage of Erection at Cowes

WITH her head high, but with tail and wings temporarily clipped, the first of the three Saunders-Roe Princess flying-boats emerged from the makers' big assembly hangar at Cowes on Tuesday, October 30th. She will now rest on the apron while erection is completed and the Bristol Proteus turboprop power units are fitted—work which should be finished in time for a maiden flight in the late spring.

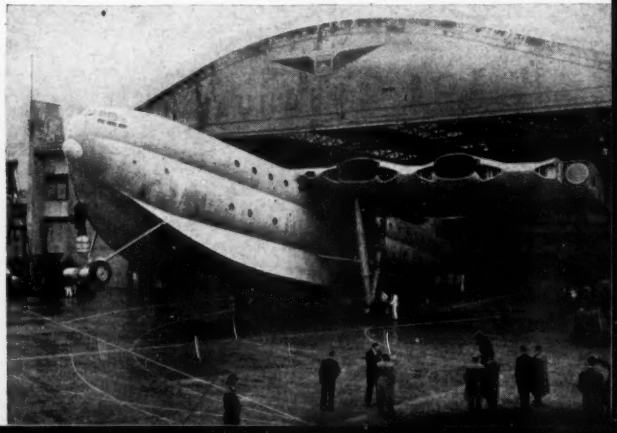
For the next week or two the craft will remain in the position shown in the heading photograph, and during this time the top 7ft section of the fin and rudder, which can be seen resting on the tailplane beside the base of the fin, will be attached. The second stage of the movement scheme will then be carried out; this will entail swinging the tail round and out over the slipway in order to give sufficient clearance for the attachment of the outer wings which are at present to be seen in cradles beside the Princess.

In this position the ten turboprops will also be installed. Only four of these units—two single and one double—have so far been delivered, but the double unit has been tried out in each of the four positions. For several reasons no engines were fitted during the move from the hangar—principally because, with only one double unit available, the aircraft would have been considerably out of balance. De Havilland airscrews of 16ft 6in diameter will be fitted and an example of a Proteus airscrew is at present undergoing flight-testing on an Ambassador (two Centaurus).

It was in 1946 that the order was placed by the Ministry of Supply for the 140-ton S.R./45 flying-boats. Originally it was the intention that B.O.A.C. should operate them on a non-stop service between London and New York, a stage-length of some 3,500 miles. Continuous headwinds averaging up to 90 m.p.h. were provided against in the designed performance. Later plans foresaw the operation of the boats by British South American Airways, but in turn these were cancelled. According to the latest official

Sharing a great deal of the responsibility for the Princesses and their future are Mr. Henry Knowler, the chief designer (left) and Mr. Geoffrey Tyson, chief test pilot.

With tail ballasted down so that the fin shall clear the roof structure, the first move of No. 1 Princess commences. Note the guiding lines painted in colours on the apron to indicate the scheme of movements. A single tractor towed the aircraft out.



announcement, "circumstances have now compelled a change in the civil plans, and the flying-boats are to be completed for the Royal Air Force."

The original interior layout—which provided luxurious accommodation for 100 or more passengers with sleeping berths, cocktail bars and so on—has been abandoned, but the important point is made that in their new troop-carrying role three Princess flying-boats could in one year transport as many troops as nine ordinary troopships on strategic and trooping routes. The principal factor in this connection is the time saved by flying compared with sea travel.

The present all-up weight of 315,000 lb may later be increased considerably, and thus the payload figure now quoted is a provisional one. The first set of ten engines will be of the Proteus 2 type, each giving approximately 3,000 e.s.h.p. When they become available, however, the further developed and more powerful Proteus 3s mentioned in the specification will be fitted and the full performance figures realized. For rather shorter ranges than those quoted, the Princess could operate satisfactorily with full payload with its original Proteus 2 turboprops.

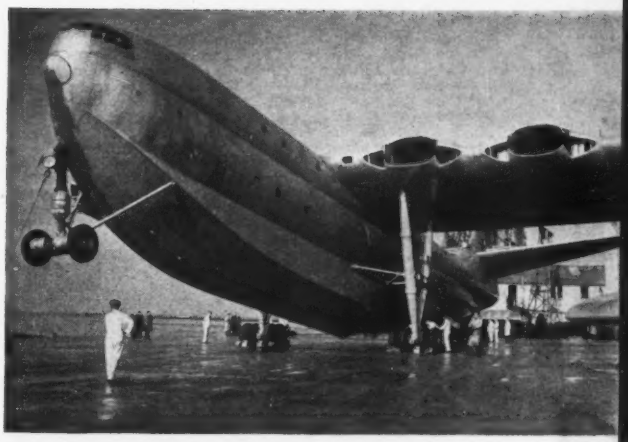
Saunders-Roe, Ltd., state that the hulls of the Princesses are the largest metal structures ever built for an aircraft, and it seems that they have a cubic capacity equivalent to that of one average suburban train or three and a half Constellation aircraft. A newspaper correspondent has calculated that, in everyday units (though not, perhaps, in the aircraft industry), 3,000,000 rivets, 2¾ acres of light alloy plating and 40 miles of electric cable have been used.

The single-step planing bottom of the hull is of a design likely to give good water-handling characteristics with clean aerodynamic form. In operation the fuselage differential pressure will be 8 lb/sq in and the double-bubble section is appropriate for high pressurization. Over the whole pressurized area this amounts to a force of 2,900 tons. Two 60 lb compressors, situated in the wing roots and driven by the inboard engines, feed the system.

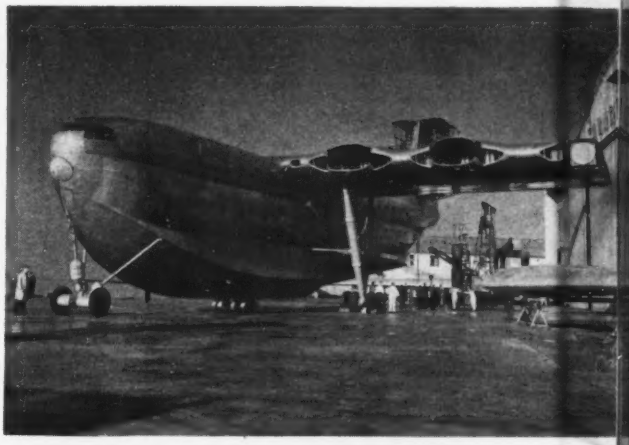
Among the large party of guests entertained by Saunders-Roe on the occasion of the Princess's first appearance, there were many who remarked with justification upon the excellent finish of the hull and the high standard of flush riveting. It is said that though larger than the Brabazon prototype (which is not flush-riveted), the Princess will have less drag.

The Princess is expected to make her maiden flight towards the middle of next year. The time and place will be left entirely to the discretion of the chief test pilot, Mr. Geoffrey Tyson. A director remarked that all they would know was that one day after a period of taxying trials the great flying-boat "will suddenly appear overhead."

Some points of particular interest regarding the construction and equipment of the Princess may be mentioned. Following careful investigation, the decision was taken at an early stage that manual controls would not be satisfactory for aircraft of the size and weight. An electric-hydraulic powered flying-control system has therefore been developed

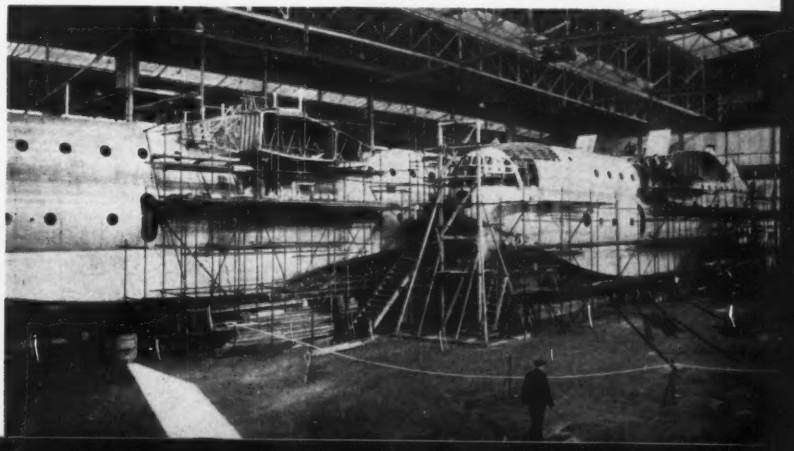


Apart from revealing many details of the form and construction of the Princess for the first time, these two pictures show another important stage in movement, namely, the lowering of the nose with the aid of water ballast tanks (and cranes) after the tail was clear of the hangar roof. Note the cloud-and-collision-warning radome in the nose.



A remarkable picture of one of the huge four-wheel beaching legs. The three chassis units, with ten wheels in all, will be buoyant.

The second and third aircraft are well advanced in construction and will follow No. 1 at approximately six-month intervals. Rails to carry the second machine to the middle of the hangar for completion are seen at lower right. The wings are well advanced in an adjoining shop.



PUSHING THE BOAT OUT . . .

that transmits, in the normal manner, the pilot's movements of his controls to power units which, in turn, produce the required movement of the control surfaces. As there is no direct connection between the pilot's controls and the surfaces, it is necessary to provide "feel" artificially. To vary the forces according to the speed of the aircraft, a travelling fulcum is incorporated.

The control surfaces are of the plain type, without either aerodynamic or static balancing. Extensive bench-testing of the control system has given satisfactory results and a Sunderland flying-boat with similar equipment has done well over 200 hours in the hands of Saunders-Roe pilots Geoffrey Tyson and John Booth. Incidentally, the flaps, of the slotted type, are electrically operated.

Anti-icing is provided for all surfaces, through the medium of thermal ducts in the leading edges. For the mainplanes the heat is taken from heat-exchangers around the jet pipes of the outer engines, while for the tail unit self-contained kerosene combustion burners, with their own separate fuel supply, will be used. The air intake for the tail heaters, which are ignited electrically from the cockpit, can be seen in the dorsal fin.

Fuel for the Princess is carried in four integral tanks positioned between the engines and bounded fore and aft by the wing spars. Total capacity is 14,500 gallons. There are no rivets in the tanks, and the nuts and bolts involved are sealed with Bostik. The wing-tip floats retract outwards to the now-familiar tip-tank position; this arrangement is subject to a Saunders-Roe patent.

At present there is no intention to paint the Princesses, and certainly both the cost and weight of the paint which would be needed would be formidable. To keep the interior cool at tropical moorings two ideas are being considered: the first, to erect awnings; the second, periodically to spray the aircraft with water.

The men particularly concerned with the Princess are: Sir Arthur Gouge, B.Sc., F.R.Ae.S., M.I.Mech.E. (vice-chairman and chief executive); Capt. E. D. Clarke, M.C. (managing director); W. Browning, F.R.Ae.S., A.M.I.Mech.E. (general manager); Henry Knowler, A.M.I.C.E., F.R.Ae.S. (chief designer); G. A. V. Tyson (chief test pilot).

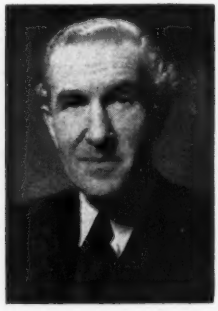
DATA SUMMARY FOR THE SAUNDERS-ROE S.R/45 PRINCESS

Span (floats down)	210ft 6in
Span (floats up)	219ft 6in
Length	148ft
Height	55ft 9in
Wing chord at root	30ft
Wing chord at tip	11ft
Wing thickness at root	5.4ft
Wing thickness at tip	1.3ft
Aspect ratio	9.5
Wing area	5,000 sq ft (approx.)
Wing loading (max.)	63 lb/sq ft (approx.)
Hull height	24ft 3in
Hull beam	16ft 8in
Hull draught	8ft
Fin and rudder height above top of hull	31ft 6in
Fin and rudder area	600 sq ft (approx.)
Tailplane span	77ft
Tailplane chord at root	22ft
Tailplane chord at tip	6ft 9in
Tailplane area	1,000 sq ft (approx.)
Cruising speed	380 m.p.h. (330 knots)
Payload	40,000 lb
All-up weight	315,000 lb
Empty weight (fully equipped)	190,000 lb
Range, still air with full tanks	4,800 naut. miles

THE NEW MINISTERS

USUALLY well-informed people in aviation who had been confidently tipping this or that member of the new Government (one in particular was quoted as a "dead cert") for the post of Secretary of State for Air, found themselves backing losers when the chosen name was revealed on October 31st as being that of Lord De L'Isle and Dudley, V.C.

Lord De L'Isle and Dudley



Mr. J. S. Maclay

Mr. Duncan Sandys

The new Minister, who is 42 years of age and was educated at Eton and at Magdalene College, Cambridge, has a distinguished war record as an officer of the Grenadier Guards, with whom he served in France and, later, Italy. (It was in an action on the Anzio Beachhead that he gained his V.C., for "superb courage and utter disregard of danger.") He had held a commission for some years before the war, and was a captain in 1939; he was promoted to major in 1943. In 1940 he married the elder daughter of the late Field-Marshal Viscount Gort of Hamsterley. The sixth Baron, Lord De L'Isle and Dudley succeeded to the title in 1945 shortly after entering the Commons as member for Chelsea. In that year, also, he was Parliamentary Secretary to the Ministry of Pensions. He is an Associate of the Institute of Chartered Accountants.

So far as we are aware, he has so far had no close connection with aviation; but surprisingly often, and in spite of the cynics, political history has produced Ministers who have made a success of their jobs through personal ability and character rather than through technical experience. The new S. of S., too, has youth on his side. We are sure the flying Services and the aircraft industry will wish this gallant soldier success in his responsible new office.

The implications of the appointment of the Hon. John Scott Maclay, C.M.G., M.P., as "Minister of Transport and Civil Aviation," will escape nobody, for speculation about the future of the M.C.A. was rife even before the General Election. (As we go to press, there are rumours of the imminent appointment of one of the permanent Civil Servants of the Ministry to a post of Director-General of Civil Aviation.) Mr. Maclay, who is a National Liberal, was Parliamentary Secretary to the Ministry of Production in Mr. Churchill's "caretaker" Government in 1945. Now 46 years of age, he was educated at Winchester and Trinity College, Cambridge, and has interests in shipping; during the war he was a member of the British Merchant Shipping Mission to U.S.A., and in 1944 became its head.

"Supply" goes to the Rt. Hon. Duncan Sandys, P.C., M.P. (43 years old, Eton and Magdalen), a son-in-law of Mr. Winston Churchill. This is not his first experience of the M.o.S., for he was its Parliamentary Secretary from 1943 to 1944, two years after he had suffered disablement during a distinguished Army career. In view of the Ministry's very apparent preoccupation with guided missiles, it is not without interest to recall that Mr. Sandys was chairman, from 1943 to 1945, of the War Cabinet committee formed to study, and combat, German secret weapons.

Lord Cherwell, the Paymaster-General, with a seat in the Cabinet, will be specially charged with the supervision of atomic-energy research and production, and with the direction of the Prime Minister's statistical branch. The distinguished career of this versatile scientist dates from the time when he was an experimental pilot at Farnborough during the First World War and subsequently director of the physical laboratory there.

As to other new Ministerial appointments, the fighting Services will welcome Mr. J. P. L. Thomas as First Lord of the Admiralty and Brig. Antony Head as War Minister. Aviation, too, finds an old friend back in office—Lord Swinton, now Chancellor of the Duchy of Lancaster; all but the youngest will remember him as Air Minister from 1935 to 1938 and Minister of Civil Aviation in 1944-45. He is still Honorary Air Commodore of No 608 (North Riding) Squadron, R.Aux.A.F.

Among further appointments, announced last week-end, are those of Lt. Cdr. J. G. Braithwaite as Parliamentary Secretary to the Ministry of Transport and Civil Aviation and Mr. Nigel Birch as Parliamentary Under-Secretary to the Air Ministry.

An Air Ministry statement says that Lord De L'Isle and Dudley has appointed Mr. T. C. G. James and Mr. D. C. Humphreys as his private secretary and assistant private secretary respectively.

FROM ALL QUARTERS

The Controller of Guided Weapons

THE Ministry of Supply announces that Mr. S. S. C. Mitchell, C.B., O.B.E., M.I.Mech.E., has been appointed Controller of Guided Weapons and Electronics, in succession to Air Chief Marshal Sir Alec Coryton, whose release from that post, in order to join the Bristol Aeroplane Co., we recorded last week.

Mr. Mitchell, who is 49 years of age, will be in charge of all work connected with British guided-weapon research, development and production. He will also assume responsibility for the direction of the Ministry of Supply's work on electronics research, development and production. In this latter field he will have, like the Ministry's other Controllers, the assistance of a Director-General —in this instance Mr. N. C. Robertson, whose appointment we reported last week.

Mr. Mitchell, who was born in India of Scottish parents, spent three years (1912-15) at the Edinburgh Academy, later studying at Osborne and Dartmouth. From 1918 to 1931 he served in the Royal Navy, specializing in gunnery, and then joined the Naval Ordnance Inspection Department at Woolwich, and after four years went to the Armament Design Establishment as second-in-command of the gun section.

In 1938, Mr. Mitchell became Deputy Inspector of Naval Ordnance at Portsmouth and twelve months later took charge of Admiralty ordnance contracts in Switzerland. In 1940 he was appointed Chief Inspector, Naval Ordnance, and from 1941-44 was Inspector of Naval Ordnance in New York.

He returned to the Armament Design Establishment (now under the Ministry of Supply) as superintendent of the gun section in 1944, and in October, 1945 became the head of that establishment as Chief Engineer Armament Design, a position he held until his present appointment.

B.O.A.C.'s Route Plans

IT is now thought likely that B.O.A.C.'s Comets may work the New York to Bermuda service towards the end of next year. Scheduled time for the journey will be about 1½ hours, or half the time taken at present. Later, the aircraft will also be introduced on the run between New York and Nassau. As Sir Miles Thomas has said, these valuable routes will indeed provide "a dollar showcase for the Comet".

B.O.A.C., incidentally, has indicated its intention of offering on the North Atlantic routes a tourist-rate single fare at substantially below £100, as compared with the £141 now charged by all transatlantic operators. A fleet of five Constellations, now being modified to "high-density" seating requirements, will make available an extra 400 seats weekly on the routes between London, New York and Montreal.

The Stout Films

WHEN Mr. E. G. Stout gave his lecture on flying-boat design at the Anglo-American Conference at Brighton, the two films which he had intended to show with the lecture could not be given as they had been impounded, for some obscure reason, by the Customs. Ultimately released, however, they were shown before the Royal Aeronautical Society on Thursday of last week and extremely interesting they were.

In the original lecture—a digest of which appeared in our October 26th issue—Mr. Stout gave a frank and clear-cut exposition of two factors which bid fair to make a great impact on flying-boat design (and have, indeed, already made that impact so far as Convair are concerned) plus a third which, even more important, is not confined to flying-boat application. These three innovations—the use of high length/beam ratios and of "spray-dams" in flying boats, and the exploration of dynamic characteristics by the use of free-body dynamically-similar-models—were all shown to advantage in the two films, both of which, incidentally, were in colour.

The sound-track commentary, perhaps, both in vein and emphasis, tended, for a British audience, to dull the brilliance of the films' content. There were desultory hand-claps at the end, but nothing like enthusiastic applause. We find this puzzling, for the films illustrated an advance in techniques which constructors in this country would do well to study—and emulate. We cannot believe that the audience were so thought-provoked by what they had seen as to be rendered incapable of expressing their appreciation.

Dr. Ballantyne, the R.Ae.S. secretary, said afterwards that the films are to be available for loan to the Society's branches: perhaps they will be better received there.

New Appointment for Mr. N. E. Rowe

AFTER five years as Controller of Research and Special Development with British European Airways, Mr. N. E. Rowe, C.B.E., B.Sc., A.C.G.I., F.R.Ae.S., Whit.Ex., is to leave the Corporation at the end of the year in order to join Blackburn and General Aircraft, Ltd., as technical director.

Mr. N. E. Rowe

Norbert Edward Rowe — known to his very many friends as "Nero"—was born in 1898, and won a Royal Scholarship to the City and Guilds Engineering College, finally graduating in Engineering at the University of London in 1923. In the following year he joined the R.A.E. and then, in 1926, went to Martlesham Heath. From 1929 to 1934 he was R.T.O. at Vickers, and then in 1938 returned to Martlesham as chief technical officer.

In 1939 Mr. Rowe was appointed Assistant Director of Technical Development, and two years later became Director in the Ministry of Aircraft Production, finally to be appointed Director-General in 1945. The following year he joined British European Airways as Controller of Research and Long-Term Developments. During his appointment with B.E.A. he has been responsible, among other things, for operational research and development with helicopters and, as a result of this work, B.E.A. is now basing its forward planning on the helicopter as the main air link in Great Britain.

The technical work begun by Mr. Rowe will be carried on under the directorship of Mr. B. S. Shenstone, chief engineer of B.E.A., but arrangements have been made with Blackburn and General Aircraft for Mr. Rowe to be made available to B.E.A. as a consultant on helicopter services.

Reference is made to other Blackburn and General Aircraft appointments on page 586.

Airwork Acquire B.O.A.C. Hermes

ARRANGEMENTS have now been completed for the award to Airwork, Ltd., of the biggest trooping contract ever to be granted to a non-scheduled operator. It involves the transport of Service personnel between the United Kingdom and the Middle East, and is worth over £1,250,000. Between the U.K. and Egypt alone some 8,000 or 9,000 passengers will be carried annually.

To meet these commitments, Airwork, Ltd., has made arrangements to purchase from B.O.A.C. at least four pressurized Handley Page Hermes IVs (this is the announcement we foreshadowed last week). They are machines of which the Corporation has not yet taken delivery, and which it will not now require, in view of the forthcoming introduction of the Comet on South African routes.

Sycamore 10 and 11

OFFICIALLY designated Sycamore H.C.10 (signifying helicopter, communications, Mk 10), the version of the Bristol Type 171 helicopter employed in the recent Army Exercise Surprise Packet is primarily an ambulance machine. Extensive modifications have been made to enable it to accommodate two G.S. stretchers, one above the other, athwartships. For this purpose, two large Perspex blisters, readily detachable when the Sycamore is used for ordinary communications flying, are added to the fuselage sides. The normal sliding doors, which would be rendered inoperative by the blisters, are replaced by jettisonable hinged doors. The engine bulkhead carries a housing for bottles of plasma and a plug socket for electrically heated blankets. A medical attendant sits beside the pilot and his chair is arranged to swivel to enable him to attend to casualties.

The Sycamore H.C.11 has been developed primarily for air observation and general communications work and accommodates the pilot and four passengers. A standard R.A.F. radio set (TR.1934) and an A.26, as used in jeeps and A.F.V.s, are installed, and there is a rope-ladder for taking personnel on board when operating over rough or sloping ground which precludes a landing. On the bottom of the fuselage are several strong-points for carrying loads up to 1,600 lb.

HERE AND THERE

R.A.F. Fanfare

WHEN Princess Elizabeth and the Duke of Edinburgh visit Liverpool Cathedral on November 17th they will be heralded by a trumpet-fanfare sounded by seven members of the R.A.F. Central Band.

The Air France Viscounts

ALTHOUGH it has been known for some time that Viscounts were to be ordered by Air France, their number has not been mentioned. It is now announced by Vickers-Armstrongs, Ltd., that a contract for twelve has been signed, to a total value of over £2,000,000. Deliveries are to start in 1953.

Swept CF-100

TWO developments of the Avro Canada CF-100 night and all-weather fighter are mentioned by *Aviation Week*. The Mk 4 variant will incorporate improved armament and radar, and the CF-103 will have swept wings and Orenda turbojets of greater thrust than those at present installed.

N.F. 11s for Belgium

THOUGH it has been presumed for many months past that the Gloster Meteor N.F.11 night fighter would become the standard machine of its class in Western European air forces, it has only recently been announced that "a certain number" of these aircraft will be supplied to Belgium.

Sabre Simulator

A VERY elaborate flight simulator for the training of F-86D pilots has been designed and built by Erco (the Engineering and Research Association, makers of Ercoupe light aircraft and much specialized equipment). A full radar installation has been incorporated, so that "enemy aircraft" can be tracked and intercepted by the pilot under instruction. The simulators are to be delivered to each new Sabre group as it is formed.

ON BEHALF OF THE R.N.Z.A.F., the Hon. F. W. Doidge, High Commissioner for New Zealand, receives a silver model of the Wellington from Maj. Sir Hew Kilner (right) of Vickers-Armstrongs, Ltd. The ceremony is reported on page 592.

Looking Ahead

WITH the object of studying the factors affecting the operation of the Saunders-Roe Princess flying-boats and of being in a position to tender for their operation should the opportunity arise, a company called Princess Air Transport Co., Ltd., has been formed. Directors are Mr.

CAPT. ALGER, to be general manager of the new Princess Air Transport Company mentioned here.

M. D. N. Wyatt (chairman), Sir Archibald Hope, Mr. G. A. V. Tyson, Mr. P. D. Irons and Capt. H. W. C. Alger (general manager). Three-quarters of the share capital is being subscribed by Saunders-Roe, Ltd., and one quarter by Airwork, Ltd. An account of the transfer of the first Princess from her hangar to the apron appears on pages 582-584 of this issue.

Naval Aviation Televised

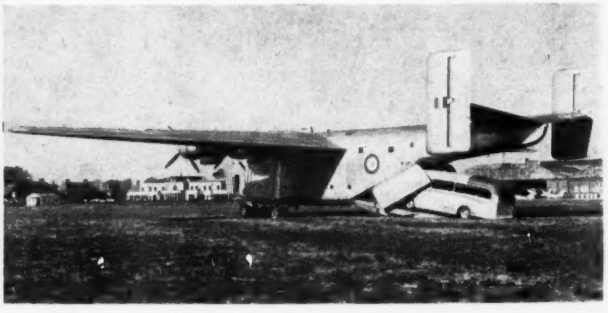
A SPECIAL air display, lasting approximately an hour, was arranged at R.N. Air Station *Gamecock* (Bramcote) last Saturday for the benefit of television viewers. It is believed to be the first occasion on which one of the Services has co-operated with the B.B.C. in this manner. A variety of aircraft took part in the programme, including No. 800 Squadron's Attackers. R.N.V.R. squadrons participated, and a helicopter demonstrated rescue operations.

More Brough Appointments

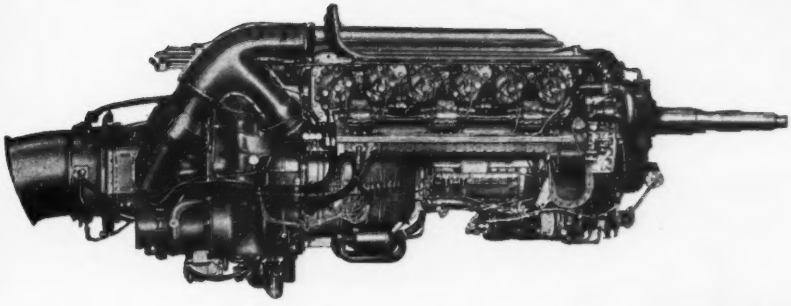
AS recorded on an earlier page, Mr. N. E. Rowe is shortly to join the board of Blackburn and General Aircraft, Ltd. Two further appointments within the Brough organization are announced: Also joining the board is A. V-M. H. N. Thornton, C.B.E., who will be responsible for sales and will have his office at the London H.Q. at 43 Berkeley Square; and Capt. Charles E. Ward has been appointed London manager. A. V-M. Thornton, who served in the R.F.C. in the First World War and held senior staff appointments in the second, has at various periods been accredited as British Air Attaché in over a dozen foreign countries. Capt. Ward, who also served in the R.F.C., was subsequently a commercial pilot and was director of Cobham-Blackburn Airlines in 1928-30, planning the southern part of the trans-African route.

Another announcement from Blackburn and General Aircraft is that they have

BUS-CONDUCTOR: A 32-seater coach was recently used to demonstrate that the Blackburn and General Aircraft Universal Freighter is literally "big enough to carry a bus"—and, as seen on the left, to dwarf it, apparently, into a scale model.



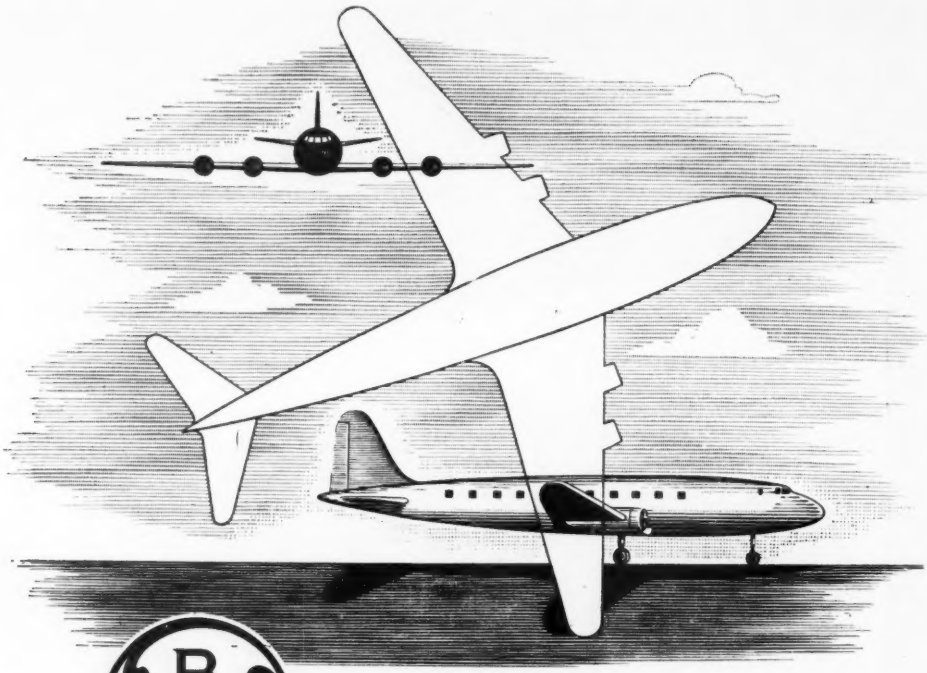
NAPIER



NOMAD

Nomad — the world's finest composite aircraft engine. Half diesel, half gas turbine, the Napier Nomad delivers 3000 h.p. to contra-rotating propellers with a specific fuel consumption unapproached in aviation. The Nomad is the latest manifestation of the engineering skill and practical originality of outlook which through more than fifty years have enabled Napiers to build outstandingly successful engines for air, land and water transport.

D. NAPIER & SON LIMITED, LONDON, W.3



B
T-H

ELECTRICAL EQUIPMENT for AIRCRAFT

Whatever the type of aircraft, BTH can design and develop the complete electric power system and supply the appropriate equipment, including :— actuators; A.C. and D.C. motors and generators; motor-generating sets with electronic regulators; gas-operated turbo-starters; Mazda lamps, etc. With over fifty-four years' experience of the manufacture of electrical equipment, and extensive manufacturing resources devoted entirely to these products, BTH is in an unrivalled position to fulfil the needs of aircraft industry.

THE
BRITISH THOMSON-HOUSTON
COMPANY LIMITED · COVENTRY · ENGLAND

Member of the AEI group of companies

A 4245

PLEASE REMEMBER GENEROUSLY WHEN BUYING YOUR POPPY ON NOVEMBER 10th

HERE AND THERE . . .

been appointed agents for the very successful range of small gas turbines developed by the French Turboméca Company; a department has been formed at their London office to handle sales. Altogether, there are ten units, including turbojets ranging from the 240-lb-thrust Piméné to the 880-lb Marbore II; turboprops; the ducted-fan Aspin II; and auxiliary power-units. Six of the ten are approved for production.

Herts and Essex to Celebrate

NOW something of a classic among flying-club "annuals," the Herts and Essex dinner and dance is to be held at the Park Lane Hotel, London, on Friday, December 7th.

TIME-SAVER : Air Chief Marshal Sir Francis J. Fogarty, K.B.E., C.B., D.F.C., A.F.C., C-in-C. of the Far East Air Force, in the Auster which he uses each day to fly from a miniature strip near his home to the H.Q. at Changi. He does the journey in 10 minutes: by car it would take 35.

Back to the Navy

IT is a common enough occurrence for people to leave the flying Services and become test pilots, but Michael Crosley, D.S.C. and Bar, who joined Short Brothers and Harland as deputy chief test pilot in 1949, has now reversed the process by rejoining the Navy. He completed about 500 hours of development flying while at Belfast.

CLOSER INSPECTION of this apparently revolutionary tandem-cockpit F-86 trainer will show it to be, in fact, two F-86s flying in extraordinarily close formation. The photograph, which we reproduce unretouched, was taken during an exercise by the 33rd Fighter Interception Wing over Nantucket Sound.

I.Ae.S. Annual Meeting

THE Institute of the Aeronautical Sciences —America's counterpart of our own R.Ae.S.—is to hold its 20th annual meeting from January 28th to February 1st, at the Astor Hotel in New York.

Identification Answer

THE Russian aircraft depicted in the picture in the adjacent column are (left to right) the twin-jet bomber, frequently referred to as Tu-10, but actually of Ilyushin design; and the Yak-14 light communications aircraft.

On and Off

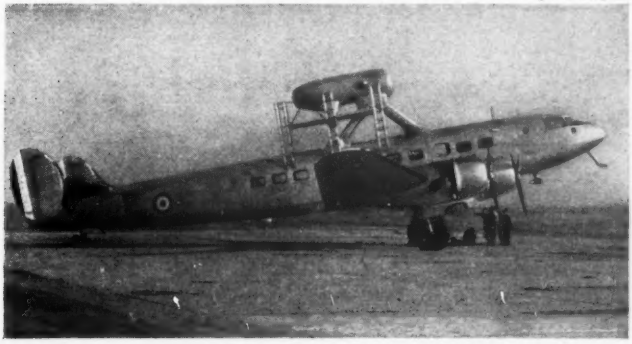
A BAN imposed by the Board of Trade on the shipment of gliders ordered by the Royal Egyptian Aero Club was lifted last week. Export had previously been prohibited on the ground that gliders, as aircraft, came under the heading of "strategic materials."

A.T.A. Memorial Roll

NEXT Sunday, November 11th, at 3.15 p.m., the Memorial Vellum of Air Transport Auxiliary—containing the names of those who lost their lives while serving in the organization—will be dedicated and placed in the library of St. Paul's Cathedral. The document was presented by Mr. Gerard d'Erlanger, C.B.E., who commanded the A.T.A. throughout the war.

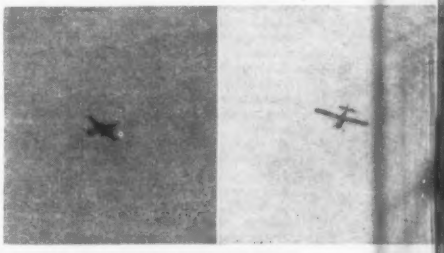
ATAR ON TOP : This Languedoc, seen recently on the tarmac at Villacoublay, is used as a flying test-bed for the Atar 101-B turbojet. The system—an interesting contrast to British methods—is probably a legacy of the test-launching of the Leduc athodyd.

"Flight" photograph



Approach to Land

AFTER flying some two million miles as a K.L.M. pilot, Capt. H. J. F. Le Good, D.S.O., D.F.C., A.F.C., has retired from aviation and is on his way to Australia to become a farmer. In 20 years, and including his war-time Pathfinder service, Capt. Le Good has logged over 16,000 hours on nearly 50 aircraft types.



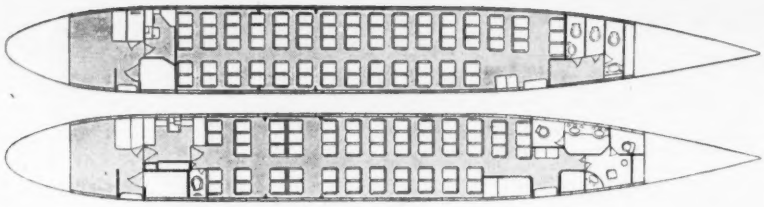
IDENTIFICATION EXERCISE : Without apology, having regard to the extreme scarcity of authentic photographs of Russian aircraft, these long-distance shots, lately secured in Germany, are presented. The aircraft are identified in a paragraph on this page.

Bags of Migs

SUMMING-UP the results of its Korean operations to date, the U.S.A.F. Fifth Air Force claims to have destroyed 99 Migs, probably destroyed 20 more, and damaged 239 others. In the last week of October 15 of these Soviet fighters were stated to have been destroyed, for the loss of six Allied fighters and four bombers. Six more U.N. aircraft were lost through A.A. fire.

Marking the R.Ae.C. Jubilee

WHEN H.R.H. Princess Margaret visited the R.Ae.C. Jubilee Ball she was presented with, in addition to *Fellowship of the Air* (B. J. Hurren's history of the club), a specially bound copy of the Golden Jubilee number of *The Royal Aero Club Gazette*. We have since had an opportunity of reading this issue—enlarged to 126 pages—and it is an effort on which the club in general, and Editor Harry Cooper in particular, deserve hearty congratulations. Apart from contributions by many aeronautical personalities, and a full roll of R.Ae.C. members, it contains some exceptionally fine photographs. Unfortunately, it cannot be purchased by the public, so anybody who wants to see a copy must persuade a member to lend him one.



Two proposed seating lay-outs for the Hermes VB, the upper one for 74 passengers and the lower for 60

PROTEUS-HERMES

Handley Page Design-study for a Larger Turboprop-powered Mk. VB

BECAUSE the Bristol company have discontinued their Theseus turboprop, the Hermes IV development which was to have been powered by these units has had to be reconsidered by its designers, Handley Page, Ltd. The prototype Mk. V with Theseus has, of course, been demonstrated on several occasions, and during its development had shown considerable promise. The turboprop now selected for the new project is the larger Bristol unit, a Proteus 3 of 3,660 e.s.h.p. Similar units are already in small-scale production for the Princess flying-boat, the Brabazon II and B.O.A.C.'s fleet of Bristol 175s.

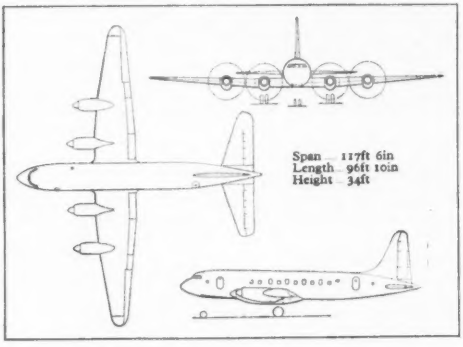
Although the fuselage of the proposed Hermes VB would be virtually the same as for the Hermes IV, wings and tail unit would be considerably modified. In particular, to make provision for the much more powerful engines, a new centre-section would run from break-points just outside the inboard engines. The span of this centre-section would be 33ft 5in, which, together with 13ft 6in intermediate sections incorporating the mountings of the outboard engines, and the present 28ft 6in outer wings and tips, would bring the total span of the VB to 117ft 6in, or 4ft 6in more than on the Hermes IV. The diameter of the airscrews for the Proteus is 14ft 6in. The most noticeable difference at the tail is the tall fin and rudder assembly, which begins like that of the earlier Hermes but has been extended by 4ft to an overall height, from the ground, of 34ft. The new tailplane span would be 48ft 6in, an increase of 5ft 0in.

Full performance figures have been calculated for this enlarged Hermes variant, and a maximum take-off weight of 100,000 lb is foreseen. The fuselage capacity, though not over-generous, would probably prove adequate to meet the requirements of most operators, and two possible standard layouts, for 60 and 74 seats respectively, are shown above. As would be expected, the performance shows promise of being exceptionally high, cruising speed being greater than for current airscrew-driven types and useful range considerably more than that of the Hermes IV now in operation with B.O.A.C.

To achieve its best performance the Hermes V would, like a pure jet, require to fly higher than is customary at present. From the passenger's point of view, however, one of the best points of its predecessor, the Hermes IV, is the comfort offered by the fully pressurized and conditioned cabins; so no new problems should arise as a result of these particular requirements.

At present the company have announced no plans to build a prototype of the VB, but, assuming that engines could be made available as soon as an airframe was ready to take them, deliveries in response to orders placed during the next few months should be well in advance of what could be offered by other manufacturers of aircraft of comparable capacity.

Some preliminary figures for the Proteus-Hermes were given in *Flight* of October 19th: the data table below will provide a more complete picture.



DATA FOR THE HANDLEY PAGE HERMES VB

Four Bristol Proteus 3 Turboprops with Feathering and Braking Airscrews

Overall length	96ft 10in / 29.51 m
Max. diameter	11ft / 3.35 m
Cabin length (gross)	65ft / 19.81 m
,, height	6ft 3in / 1.91 m
,, width	10ft 3in / 3.12 m
,, volume	3,492 cu ft / 98.88 cu m
Freight volume under floor	262 cu ft / 7.42 cu m
Span	117ft 6in / 35.84 m
Wing area	1,480 sq ft / 137.6 sq m
Root chord	16ft / 4.88 m
Tip chord (projected)	5ft 10in / 1.78 m
Aspect ratio	9.34 / 9.34
Total flap area (in plan)	153.9 sq ft / 14.3 sq m
Tailplane span	48ft 6in / 14.78 m
,, area	486 sq ft / 45.2 sq m
Fin and rudder area	270 sq ft / 25.1 sq m
Overall height of aircraft	34ft / 10.4 m
Fuel capacity	3,532 Imp. gall. / 16056 litres
Track	26ft 2in / 7.98 m
Wheelbase (leg centres)	29ft 8in / 9.04 m
Max. take-off weight	100,000 lb / 45.359 kg
,, landing weight	83,000 lb / 37,648 kg
Wing loading at max. T.O. weight	67.6 lb/sq ft / 329.9 kg/sq m
Power loading at max. T.O. weight	6.95 lb/b.h.p. / 3.11 kg/cv
Basic equipped weight	59,000 lb / 26.762 kg
Max. capacity payload	17,000 lb / 7.711 kg
Max. weight less fuel and oil	76,000 lb / 34.473 kg
Shaft horsepower per engine (max.)	3,350 b.h.p. / 3.397 cv
Jet thrust per engine	800 lb / 362.6 kg
Airscrew diameter	14ft 6in / 4.42m

Performance

Take-off at S.L. (100,000 lb, I.C.A.N. + 15 deg. C.):—		
Ground run	2,910ft	885 m
Total distance to 50ft	3,264ft	990 m
Accelerate stop distance	5,406ft	1650 m
Climb at max. a.u.w.:—	*Four Engines*	*Three Engines*
Rate of climb S.L.	2,250 ft/min	1,305 ft/min
,, ,, 20,000ft	1,055 ft/min	350 ft/min
Time to 20,000ft	12.4 min	—
,, 30,000ft	26.5 min	—
Service ceiling	34,900ft	24,600ft
Level speed (at 95,000 lb), I.C.A.N.:—		
Sea level	355 m.p.h.	570 km/hr
10,000ft	375 m.p.h.	604 km/hr
20,000ft	386 m.p.h.	621 km/hr
30,000ft	383 m.p.h.	616 km/hr
	At 360 m.p.h.	*At 390 m.p.h.*
Range for max. payload	2,760 miles	2,560 miles
Payload for 2,500 miles	17,000 lb	17,000 lb
,, ,, 3,000 miles	15,200 lb	13,900 lb
,, with full tanks	12,650 lb	12,650 lb
Range with full tanks	3,360 miles	3,780 miles
Mean fuel consumpt. (at 87,500 lb)	0.949 a.m.p.g.	0.881 a.m.p.g.
Landing at S.L. (83,000 lb, I.C.A.N. + 15 deg. C.):—		
Approach speed	122 m.p.h.	196 km/hr
Landing speed	112 m.p.h.	180 km/hr
Ground run	1,926ft	590 m
Total distance from 50ft	2,592ft	790 m

MANPOWER v AIR POWER

The Essence of a Serious Situation: An Analysis by the Air League's Chairman

AN arresting picture of our present air rearmament situation was given by Air Chief Marshal Sir Guy Garrod, chairman of the Air League of the British Empire, in a speech at the luncheon given by the League at Londonderry House on November 1st.

Sir Guy first touched on the present inadequacy of provision for air transport, and re-emphasised the observation made by Lord Bruce of Melbourne on the opening day of the S.B.A.C. Farnborough display. He went on to say that an immense industrial effort was required in order to provide the very large numbers of aircraft of all categories which would be required before this country and the Commonwealth could be considered to possess the necessary air power—not just power to meet the menace of another war, but to deal with situations which were constantly developing n the uneasy state of semi-war which had so long existed in the world.

The essentials for any manufacturing undertaking of such a nature were raw materials, machine tools and manpower. Whilst a good deal had been done during the past eighteen months to remedy the shortage of raw materials and machine tools, a manpower situation had been developing about which little or nothing had been attempted. The situation was now critical. The whole of our air rearmament programme and, perhaps, of our military and naval rearmament programmes, was in peril because of the lack of manpower, and particularly of skilled manpower.

The rate of recruitment into the aircraft industry was worse now than it was at the beginning of the year. The late Government's intention was that the less essential industries should lose men for the rearmament industries, but this had not happened, as the official figures showed—quite the reverse in some cases. Even if some of the industries engaged on non-essential products were manufacturing for export, the question arose whether there might not be other exports equally valuable as far as their earnings were concerned, but which would be more important because, in case of need, their products would be valuable in the rearmament effort.

Strategic Exports

In this connection, Sir Guy went on to say that this country at present had a lead of at least five years over the rest of the world in turbojet and turboprop transport aircraft. We ought, therefore, to be producing these aircraft in considerable numbers. We needed them as part of our military equipment and, at the same time, they would be a most valuable export, not least in securing a permanent position in the world market for many years to come. But we were in danger now of repeating the disastrous decision made during the last war of leaving the building of transport aircraft to the Americans. The foreign airline operators fully appreciated the potentialities of the new gas-turbine aircraft, but could not be expected to buy them unless they could have delivery. But by expanding our output of transport aircraft we could, at one and the same time, create an actual and potential export trade, and also make an indispensable addition to our air-power resources.

Referring to the manpower situation, Sir Guy said that it should be borne in mind that by no means the full amount of orders required by the current defence programme had yet been placed; in fact it seemed likely that, unless something was done, some of those orders might never be placed. We were still to a large extent in the preliminary stages represented by such things as factory construction and tooling. The *Economic Survey for* 1951 stated that by April, 1953 the aircraft industry and the Ordnance factories would together require an additional labour force of 175,000, of which it was calculated that the aircraft industry alone would need 160,000. Actual recruitment since the programme began was only about 10,000 up to the end of July this year, leaving another 150,000 to be found by April, 1953. This worked out at an average intake of 7,500 a month and yet, during the four months from April to July, this year, the average rate of intake per month was only 850. This showed how far our air-defence programme was falling short of its planned realization.

In the basic industries which were the very foundation of rearmament, such as iron and steel smelting, rolling and forging, sheet and tinplates, electric cables, non-ferrous metals, and many others, the manpower situation was even worse than in the industries directly associated with the construction and equipment of aircraft, because the labour force was actually declining.

Yet whilst this crisis had been developing in the industries which produce the aircraft, guns and tanks, official statistics showed that increasing manpower was being employed in such industries as cocoa, chocolate and sugar confectionery, tailoring and dressmaking, toilet preparations, toys, games and sports requisites, and so forth.

Most of the problems stemmed from the fact that there was no pool of unutilized manpower from which to draw. But the fact had to be faced that, in addition to the requirements of the aircraft industry and Ordnance factories, more than 300,000 men would, before long, be required—many of them were already urgently needed—to cope with the total of defence contracts as rearmament proceeded. Even then, we should have something like 250,000 fewer people employed in rearmament than were so employed in 1939, just before the last war began.

With the total of unfilled vacancies in all types of employment standing at nearly half a million (the highest for three years), it seemed pretty obvious that there would have to be a good deal of what the official report on manpower euphemistically termed "rearrangement of labour" if the defence industries were to get the manpower they required. But we had never been told that any steps were being taken to deal with the matter.

Control or Incentive

The effect of this shortage of skilled men was cumulative; for example, the output of factories and their precious machine tools could be increased by working double shifts, but double shifts could not be worked because there were not enough skilled men. The industries doing urgent defence work suffered severely from the fact that they had to lose many skilled men who were taken away for National Service just when they had completed their apprenticeship. Again, some firms engaged on non-essential work were retaining skilled labour by introducing short time, whilst others engaged in rearmament work had vacancies they were unable to fill. Then there was the fact that firms were free to bid against each other for skilled labour without regard to the importance of the work they might be doing. Sir Godfrey Ince, Permanent Secretary of the Ministry of Labour, told the Select Committee on Estimates that this question, which was most important in relation to defence, had never been satisfactorily dealt with except by the Control of Engagement Order, which was in fact revoked in March, 1950.

Could we, asked Sir Guy, afford the luxury of a five-day week in the present state of the world and in view of our deficiencies in defence? What incentives could be offered to workpeople to increase their output? They would work harder if they were put in the picture and told the full story. But to get maximum results there had to be incentives—of many possible kinds, ranging from various forms of payment by results to such things as working-week increases accompanied by exemption of increased earnings from income tax.

State of Emergency

To relate the critical manpower situation mainly to air defence the then-Secretary of State for Air had quite recently said that, in the event of war, Russia and her satellites could launch from Eastern Europe tactical air forces of more than 8,000 aircraft in addition to a substantial bomber force—a concentration three times as large as the air force available to Hitler in 1940. Sir Basil Embry, Commander-in-Chief of Fighter Command, had recently said that, whereas in 1940 six and a half per cent of attacking bombers were shot down, in the next war 100 per cent would have to be shot down—over the sea. The recent air exercises pointed a lesson which we dared not ignore: that our aircraft at present in service were inadequate in numbers and mainly obsolescent in type. But added to this was the necessity for providing the true air defence which was by a vigorous bomber offensive to crush the enemy's air power at its source. Added to all this again was the provision of aircraft in sufficient numbers to cope with the equal and possibly deadlier menace to our security, the submarine. One then began to realize the tremendous industrial effort which would be needed to make adequate provision for our safety.

Sir Guy concluded with the observation that although it was a commonplace that machines were of no use without men to fly them, it was equally true that there were no machines unless first there were men to build them. Our air rearmament would remain to a large extent on paper, or at best its realization would be prolonged beyond the limits of safety unless immediate action was taken to deal with the present causes of delay.

AROUND IRAQI AIRWAYS

By GEOFFREY DORMAN, A.R.Ae.S.

The area—one very much in the news at the moment—in which the author's Iraqi Airways tour was made.

A Small But Efficient Organization Operating with B.O.A.C.-trained Personnel

AIRLINE-touring, with an eye both to scenery and technical equipment, is a hobby of Geoffrey Dorman's. Previous tours have been described by him in "Flight" of January 12th, 1950 (By Solent to Nyasaland), July 13th, 1951 (West African Airways) and October 5th, 1951 (Central African Airways).

IN August last I made a tour of a considerable section of Iraqi Airways routes; this is a state-owned corporation, and is a department of Iraqi State Railways, under whom the airline operates. The director-general of the State Railways is W. J. Moffat, C.B.E., and the manager of Iraqi Airways is Col. Sabah El Said, a thoroughly keen and knowledgeable aviation type, who is son of the Prime Minister of Iraq. During the heat of the day most business is suspended, but I found Col. Said was never too busy to talk about flying. He invited me to meet him at the Railway Club in Baghdad, and we sat beside the swimming pool and talked aviation like a couple of old hands. The airline's commercial manager is Sayid Kanaan Al Askari.

Just as the R.A.F. are advisers to, and train, the personnel of the Iraqi Air Force, so Iraqi Airways personnel are advised and trained by B.O.A.C. and I found that a very happy relationship existed between the two airlines and between Iraq and the U.K.

An air view of the city of Baghdad, with the Tigris running through the southern part of its centre. Baghdad West Airport is in the right background, just beyond the bend in the river.

The chief pilot is Capt. T. M. Walters, who is seconded from B.O.A.C., and he also has with him Capt. Arthur Trebble and Capt. Ralph Watts, both seconded from B.O.A.C. There are three Iraqi captains, all of whom were trained by B.O.A.C. and did part of that training with Air Service Training, Ltd., at Hamble. These Iraqis are Capt. Ismail ("Sam") Fattah (senior captain), Capt. Yousif El Koury, and Capt. Ahmed Tikriti. I flew once in a very bad sandstorm with Capt. Fattah, and he inspired very great confidence; I would have found it difficult, if I had not been told beforehand, to distinguish his flying from that of a B.O.A.C. pilot. He is, too, fair-skinned, talks aviation slang just like a Briton, and knows just how to keep his passengers happy in the true B.O.A.C. style. The Iraqi fleet consists of three Vikings and three Doves. First officers, radio officers, navigators, and stewards are all Iraqis.

Pat Gillibrand of B.O.A.C., who has recently come to Baghdad after being for some years on the sales side in Hong Kong, is B.O.A.C. representative in Iraq, and was also full-time commercial adviser to Iraqi Airways. His advice was so good that I.A. are beginning to stand on their own feet, so Pat now holds the title of B.O.A.C. representative and is available for consultation to Iraqi Airways for 45 per cent of his time.

A. D. Bennett, A.F.C., whose second name is Donald and who is known throughout the Middle East as "Don Bennett" (though he should not be confused with the famous air vice-marshal of the same name), is seconded from B.O.A.C. as technical adviser and is regarded by the Iraqis as a very sound man and one easy to get on with. He succeeded Col. M. C. P. Mostert, O.B.E., who, said Gillibrand, had done more than anyone else to put Iraqi Airways on a firm footing in their early days

The headquarters and booking office are in the main street of Baghdad, not far from the Semiramis Hotel, with more offices at Baghdad West Air Port, where there is also hangarage and a maintenance base. The airport closely adjoins the main Baghdad railway station and it is the intention, in the course of time, to have the airport building and station building in one, so that passengers can get straight from a train into an airliner, or *vice versa*. This will necessitate only the diversion of the taxi tracks and new hard-standing. A combined railway station and airport building is believed to be unique. The airport, which lies about half a mile south of the River Tigris, is large, with splendid runways and unobstructed approaches.

The principal Iraqi Airways routes are Baghdad to Basra (276 miles), Basra to Kuwait (82), Kuwait to Bahrein (269), Baghdad to Teheran (428), Baghdad to Damascus (470) and Baghdad to Beirut direct (513). Many services from Baghdad to Beirut call at Damascus, which is 43 miles from Beirut. Baghdad to Cairo direct is 796 miles; some services call at Damascus. There are also services from Baghdad to Mosul (224 miles), Mosul to Aleppo (336) and Baghdad to Jedda (925).

There are immense possibilities for expansion, for Baghdad Railways are not very extensive, consisting mainly of a single route to Basra in the south and to Mosul in the north, then to the Syrian border where it joins the line to Aleppo and Beirut. The roads of Iraq must be among the very worst in the world. The second-class routes such as that from Baghdad to the Arch of Ctesiphon would compare unfavourably with an English farm-

cart track before the days of mechanisation. Most roads in Baghdad itself are simply appalling, and few car springs can stand up for long. Even the main roads, such as that to Babylon and Basra, or to Mosul, have sudden corrugations and potholes which make high speeds dangerous. I was told that the senior officers of the R.A.F. station at Habbaniya, 40 miles from Baghdad, prefer to fly to Baghdad West and get a car to the city rather than make the car journey over the bad roads.

Great irrigation schemes are in hand for leading the water from the Tigris and Euphrates to render fertile vast tracts of desert which could become great new sources of food; and vast oil developments are certain. Iraq is at present a very poor country financially, and aid from the United Nations will be necessary to carry out such vast projects. But they should bring great wealth to the country, and will necessitate great extensions of the airways. A considerable fillip has already been given to the extension of the Iraq oil fields by the behaviour of Iran. It is believed that the loss of Iranian oil could very soon be made good if the potential but yet undeveloped oilfields of Iraq could be quickly equipped with modern plant.

After a tour of Aden Airways I was taken over by Iraqi Airways at Farouk Airport, Cairo, at mid-day on August 30th, and embarked in Viking YI-ABR *Al Mahroussa*, with Capt. Ralph Watts (B.O.A.C.), 1st/Off. Fouad Azar Elbanna, R/Off. Sammy Yassawi, and Steward Amin Toma.

We climbed at once to 7,000ft, where the air was smooth, and flew north, parallel with the Nile Delta on the east bank. I am always amazed how the fertile delta area ends sharply in sheer, stark desert, with no gradual merging. In the Delta are dozens of towns and villages in the midst of intensive very green cultivation. Nearing the Mediterranean, the coast merges into sea much less suddenly, the presence of the sea being heralded by sandbanks, islands, and creeks.

The air was smooth and the Viking was kept pleasantly cool. Steward Amin Toma served us with lunch-boxes containing cold pressed beef and salad, grapes and bananas, and with most welcome iced grape-fruit juice. We flew parallel with the coast of Israel, keeping outside the three-mile limit, as Israel is still at war with Egypt. We could just see the Israel port of Haifa which is close to the border of Lebanon. After passing Haifa we drew in close to the coast and passed the Lebanese port of Tyre, which stands on an anvil-shaped promontory with sheltered bays to north and south; and then we flew over Sidon. Between these two ports is the termination of the oil pipeline from the Persian Gulf. Four tankers were moored about a quarter of a mile offshore, taking in oil from floating lines. The tanker areas are marked by semi-circles of white buoys. Around one buoyed area was a patch of floating oil where a tanker had recently been loading.

Famed Mountain

Inland was the 9,000ft summit of Mount Hermon, famed in the Bible for the quality of its dew. The rounded summit was protruding through the cloud which covered the mountains on the sea side. We turned inland here and, as soon as we had crossed the first of four mountain ranges which separate Syria from the sea, the cloud cleared. Between the mountain ranges are three green and fertile valleys, and beyond the fourth range the desert began, with Damacsus lying in a green oasis of considerable size. We covered the 369 miles from Cairo to Damascus in 2 hrs 5 min, landing on a good two-runway airport south of the city.

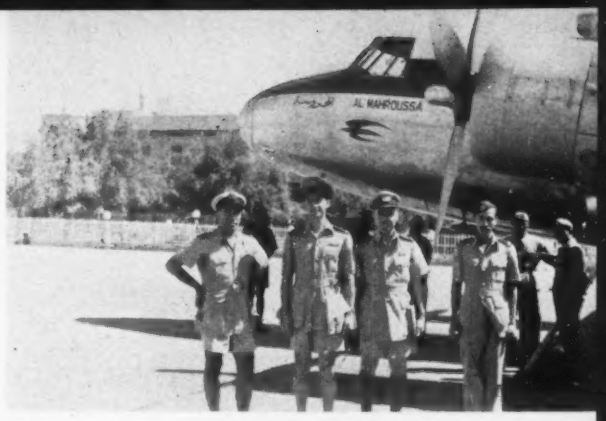
At Damascus I was met by Pat Gillibrand of B.O.A.C., who was then also commercial adviser to Iraqi Airways; he had come to Damascus to settle certain points of policy in relation to carrying through-passengers, from Baghdad to Beirut only, in Argonauts. I was wearing my Hong Kong coolie suit which I had bought when I stayed with Pat in Hong Kong the previous year and he greeted me in Chinese, which left me dumber than usual!

We stayed for the night in the flat of Les Brown, who was then B.O.A.C. representative there, and who was expecting to be relieved soon by "Lulu" Bennett from Dakar. As we sat on the verandah of his house overlooking the Lebanese mountains enjoying cool drinks, the sun went down, and so did the temperature.

The next morning Pat and I rubbernecked in Damascus and saw the house on the wall from which St. Paul was let down by the disciples by a rope when fleeing from the Jews, and also the Street Called Straight—in which we got into a good traffic jam with our car, a lorry, two donkeys carrying panniers of mealies, and a brace of camels. Owing to lack of town-planning down the ages the Street is now only *fairly* Straight!

By the tomb of Saladin we saw the graves of three Turkish airmen who were the first to be shot down in the 1914-18 war. We also visited the Mosque of Omaryades, in which lies the head of John the Baptist.

We then set out by car for Beirut, 50 miles distant, across the 9,000ft mountains, going by way of Baalbek to see the ancient ruins of the Temples of Jupiter, Venus, and Bacchus which are somewhat "part-worn" as the result of Phoenician, Arab, and Roman invasions, and a great earthquake in 1791.



All-Iraqi crew of Viking YI-ABR outside Basra airport building. Left to right: Capt. Sam Fattah, 1st Off. Mufti, R/Off. Hakim, Steward Selam.

We found Beirut very hot and humid but enjoyed delightful bathing in the Mediterranean from the St. George's Hotel. Both Lebanon and Syria were until recently French mandated territories, but are now self-governing. The locals, one noted, preferred to speak to Europeans in English. We dined under the stars at the St. George's Club nearby, with Eric Gaston, the B.O.A.C. agent in Beirut, and with the local Air France manager.

At 11 a.m. the next day we left the hotel for the airport 5½ miles distant along a road with much traffic and many sharp turns. The aircraft was due to leave at 11.30, so we had not much time, especially as there were customs and emigration formalities with which to cope. We did the drive in 20 minutes; by far the most frightening I have ever had, it once again emphasized that the most shaking part of any air trip is the journey between airport and city. Much to my surprise we survived and I looked forward to sinking back into a comfortable seat in the aircraft and recovering my nerve in the tranquility of flight.

But it was not to be as easy as that. There was first a delay of 30 minutes as a Turk and an American, who had flown in from Baghdad that morning had not got their entry visas for Lebanon strictly in order. So they were told to return to Baghdad and we embarked in the Viking; but there was further delay and argument. As the Viking was excessively hot with the midday sun beating down, we all got out again and had iced squashes alongside.

After a further 25 minutes we re-embarked and took off for Damascus in Viking YI-ABR, with Capt Arthur Trebble (B.O.A.C.), 1st/Off. Jaweed U. Draz, R/Off. Selim P. Atallah, and Steward Hadi Hoomi. After take-off we had to make a wide circuit to sea to gain sufficient height to cross the 9,000ft Lebanese mountains with 1,000ft to spare. The flight was very bumpy, but we reached Damascus in 25 minutes. There the American and Turk were given exit visas and advised that they could hire a car to take them back 50 miles to Beirut and could get entry visas into Lebanon at the frontier, just as Pat and I had done the previous day. The Lebanese immigration officials are by far the most difficult and unnecessarily officious of any that I encountered in the Middle East or anywhere else.

We then started out on the 470-mile crossing of the desert to Baghdad, climbing to 13,000ft to avoid the turbulence from the great heat. That is somewhat high to fly unpressurized, but no one was adversely affected; and as lunch was being served it was much better to fly in stable air. It is usual under such conditions not to let passengers know the height, for ignorance on such matters is bliss, and many people, especially women, imagine they are being adversely affected by great height, yet are quite unaffected if they do not know!

After about four hours of desert (on which the only feature was a patch of what must once have been a volcanic area—a number of dark, conical basalt hills with round craters at the summits), I saw what looked like a long green snake coming from the north-west. It proved to be the River Euphrates, which we followed till we reached Lake Habbaniya, an amazing expanse of blue water in the desert. This was the flying-boat base for Baghdad in the days of the Imperial Airways "C" class Short Empire boats. Just to the north of it is the great R.A.F. base which houses the Air Headquarters based there by the treaty with Iraq when it became self-governing. The lake is now controlled, and acts as a balancing reservoir to keep both Euphrates and Tigris at the most suitable levels for irrigation.

We soon saw the Tigris to the north and noted the fertility of the land between the rivers, once known as Mesopotamia. West of Baghdad is a tower which from the air looked rather like a pear-drop. It marks an ancient temple, the Ziggurat of Aqqar Kuf, made of sun-baked mud bricks—which are the Biblical bricks that could not be made without straw.

From the air, Baghdad looks a big city. Its many mosques,

AROUND IRAQI AIRWAYS . . .

minarets and domes (including the famous Golden Mosque, which is a very lovely sight from the air) are visible both during the approach from the west and take-off. We landed at Baghdad West after 4¼ hours' flying from Damascus. Disembarking from the Viking was like stepping into an oven. Ground-staff here enjoy going into an airliner which has just landed, as it is cool within by comparison.

Pat Gillibrand drove me to his house in South Baghdad and there we found his 3½-year-old son, Michael, recovering from a brief illness. He and his brother John, aged 5½, have between them done over 75,000 miles flying by B.O.A.C. and associated lines.

Baghdad in August is certainly the hottest place which I have yet experienced. Windows and doors must be closed and curtains drawn during the day to keep the heat out.

Pat had warned me that I was booked to give a talk to the staff of Iraqi Airways—on "early flying days"—at 6 a.m. the following day. Such an early hour for a talk seemed a bit barbarous, but I soon found that is the best time of day in Baghdad. After my talk, and breakfast at the Semiramis Hotel across the road on the bank of the Tigris, I was driven to the airport and embarked in the same Viking bound for Basra, Kuwait and Bahrein. The skipper was the Senior Iraqi, Capt. Sam Fattah, and the rest of the crew were 1st Off. Mufti, R Off. Hakim, and Steward Selam. Soon after take-off we flew over the famous Arch of Ctesiphon, the ruins of an ancient banqueting hall. As we flew between the Euphrates and Tigris I noted how, by each stream and creek, the land was green and fertile, and it is obvious that scientific irrigation could produce crops equal to those of the Nile belt and delta. Somewhere between these rivers, and between Baghdad and Basra, is the supposed site of the Garden of Eden.

About 30 minutes after leaving Baghdad Capt. Fattah asked me to come to the flight deck. Ahead of us I saw great billowing yellow clouds which were the trailing edges of a sand-storm raised by a 45 kt north wind. The top was at 8,000ft, so we went over it and then down through it for our let-down to Basra. It did not worry the skipper, who is quite used to such conditions. During the let-down I listened on the headset phones to the B.B.C. in London, giving the latest news of the Iranian oil crisis. Iran was only about 50 miles away to the east ! In Iraq, incidentally, I noted that people (especially oil people) seemed far less concerned about it than do those in the United Kingdom.

More Sandstorms

As we neared Basra visibility improved, because the city is surrounded by miles of swamp. Moored in the Shatt-el-Arab, which is the name given to the merged Tigris and Euphrates, there were two British destroyers; they lay just off Basra. It was extremely hot and rather humid on the ground and I was glad when the B.O.A.C. representative invited me to his office for an iced squash. After 45 minutes on the ground we embarked again, having to go through customs and emigration formalities on leaving Iraq. We took off, going quickly into the sand-storm and in 30 minutes we arrived over Kuwait (82 miles beyond Basra), which is a big town with harbour, the centre of one of the newer oilfields, operated by joint Anglo-American interests. The airport is just a bit of desert with the perimeter wall made of oil drums, and runways similarly marked.

We were scheduled to stop for only 20 minutes, but visibility became so bad that we had to wait. After an hour it became clearer so we taxied to the runway. We waited for 20 minutes, then were able to get airborne during a slight clearance. We flew through sand for nearly 30 minutes, but at last got above it. As we neared Bahrein the air cleared and we had a good view of the Bahrein group of four or five islands. The biggest is about 40 miles long from north to south and ten miles broad, with the town of Manama on the north-east corner. The airport is on a small island just north-east of Manama, to which it is joined by a causeway.

We stayed at Bahrein for an hour, during which I had lunch in the airport restaurant; just outside was a tree bearing a bunch of ripe bananas, one of which I picked and ate. Soon after take-off we ran into the sand-storm which had meanwhile moved about 100 miles farther south. We went above it and then down into it to try to land at Kuwait, as we had one passenger to drop there. But though we went down to 500ft we could see nothing, so we flew on to Basra, which was still fairly clear; the passenger would fly back 82 miles to Kuwait on the service the next morning.

There was a bit of a flap at Basra as I had no entry visa for Iraq. I pointed out that I had only left Iraq a few hours earlier to see the route, so after much chatter I was given a cut-price visa for 3s 6d instead of the normal 35s, and everyone seemed happy. The journey back to Baghdad took 1¾ hours, due to the head wind which was raising the sand-storm, but Baghdad was quite clear.

The next day Pat and I went to the airport at mid-day to watch the arrival of the B.O.A.C. Argonaut G-ALHK *Atalanta* from London, on which I was to return home the next day. I was delighted to find the skipper was Capt. Oscar Barnett, with whom I had flown three times on Solents to South Africa, and Stewards Simon Watson-Taylor and Duggie Roe, with both of whom I had flown many times; so I knew I would be among friends and was assured of a pleasant flight as far as Rome.

That evening, as the day cooled, Pat drove me 54 miles south to the ruins of Babylon, much of which is well preserved. It was all built of mud bricks, and one can see the ruins of the Hall of Balchazzar (though the writing on the wall is no longer there !) and the site of the Tower of Babel.

The next morning—August 6th, Bank Holiday—we left in the Argonaut; the crew were, in addition to those mentioned above, 1st Off. Peter Tebbit, Nav Off. Hodder, R Off. Gwilliam and Stewardess Doris Fishell. Our first leg was to Beirut, 513 miles, then Beirut-Rome 1,389 miles, and Rome-London 930 miles. After leaving Beirut we passed over Cyprus, which looks very arid, as though a bit of mountainous desert had drifted out to sea; and then over the equally arid Dodecanese Islands. When you have seen one Dodecanee you have seen them all ! As we neared Rome we passed almost over the top of Vesuvius and had a fine view of its crater, which looked very dead.

Our crew were due to "slip" at Rome, and it was just as well, for several of them had sore throats from a germ picked up on the outward trip, and all went to hospital in Rome. The flight from Beirut had been 6¼ hours. We took off for London after 1½ hours with a new crew consisting of Capt. Ronald Chitty, 1st Off. Reginald Tibble, Nav Off. Roots, R Off. Wigglesworth, 1st Steward Franks, 2nd Steward Hooker (making his first trip as steward and doing it very well), and Stewardess Sheila Green. Weather deteriorated as we flew north and soon after we passed over the north coast of Italy the cloud thickened and we saw nothing more till we came through it at Reading, where we saw the roads running with water. This, you may recall, was August Bank Holiday, the day on which the *Daily Express* Air Race was scrubbed by bad weather. My thoughts turned back seven years to the last time August 6th and Bank Holiday coincided, for on that day I had a bad gliding crash in which I broke a thigh; I little thought then (if I thought anything) that I would celebrate the anniversary by flying from Baghdad to London in great comfort !

After the intense heat of Baghdad I found the cool rain of London quite pleasant, though holiday-makers clearly did not share my view. I have never known immigration and customs at L.A.P. do their stuff so quickly and courteously. I was in the bus ready to go to Airways Terminal within 20 minutes of our wheels touching No. 2 runway, and all the 36 passengers were through in a further 15 minutes. We had a quick run to Airways Terminal and I was in my Chelsea flat within 1½ hours of first touching the runway. If that can be done once, it could be done regularly.

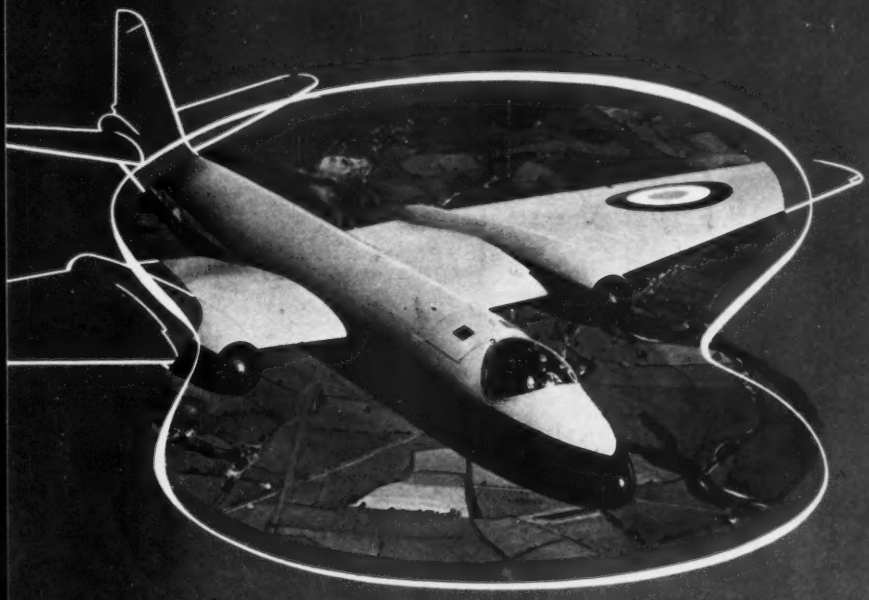
"SILVER WELLINGTON" FOR R.N.Z.A.F.

IN the presence of a number of distinguished senior R.A.F. officers, including the Vice-Chief of the Air Staff, the A.O.C.-in-C. Bomber Command, the Air Member for Personnel and also of representatives of the R.N.Z.A.F., R.A.A.F., Pakistan and Indian Air Forces, the High Commissioner for New Zealand, the Hon. F. W. Doidge, accepted a silver model of the Wellington bomber on behalf of the R.N.Z.A.F. from Sir Hew Kilner, deputy chairman and managing director of Vickers-Armstrongs, Ltd. The presentation took place at the Savoy Hotel, London, on Wednesday of last week.

In handing over the model, Sir Hew Kilner reminded guests that shortly before the outbreak of war in 1939 the New Zealand government had ordered a number of Wellington bombers; the first six had been completed and accepted, and were about to be flown out to New Zealand, when the war broke out. With that spirit which our Dominions had always shown when this country has been in need, added Sir Hew, the New Zealand government immediately offered this flight of Wellingtons as a gift to the British Government, and added for good measure complete crews to man them. It was thus that the first New Zealand Flight equipped with Wellingtons was formed to do great service with the R.A.F. during the first months of the war.

The flight was quickly expanded into a squadron of Wellingtons, the famous 75 Squadron, R.N.Z.A.F. "I must admit", said Sir Hew, that my company was, and is, very proud of the Wellington, or 'Wimpey' as it was affectionately known, and of the great part it played in the bombing raids of the first few years of the war. In those raids No. 75 Squadron played its part to the full, gaining great distinction and rapidly acquiring a reputation second to none."

The first commander of 75 Squadron, A. Cdre. Buckley (who is well known from his recent tour of duty as Liaison Officer in London) was unable to be present, but some of the squadron officers were welcomed, including A. Cdre. Kay, who commanded the first flight on formation and, subsequently, the squadron.



THE CANBERRA

-supreme in design, fitted with
Martin-Baker Patent Ejection Seats

Ejection Seats

MARTIN -BAKER

AIRCRAFT CO. LTD. HIGHER DENHAM NR. UXBRIDGE MIDDX.

Handley Page Ltd

GLOSTER

BEA

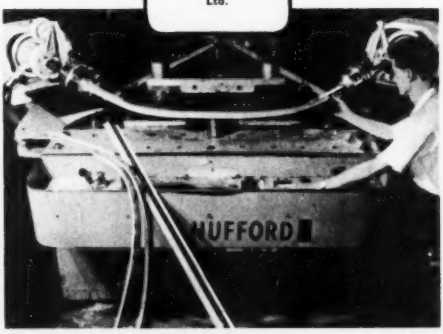
Bristol

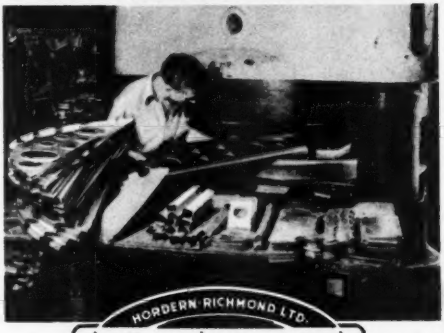
N. V. K. N. V. FOKKER (HOLLAND)

AIRCRAFT PRODUCTION (AUSTRALIA)

SERIAL 4

Hawker Sea Fury and Sea Hawk production. Photographs by courtesy of Hawker Aircraft Ltd.





HORDERN-RICHMOND LTD.
laminated-compressed
Hy-du-lignum Regd.
"the made-to-measure wood"
HADDENHAM-BUCKS-ENGLAND

DH AIRCRAFT

FOLLAND

AWA

HESTON AIRCRAFT COMPANY LIMITED

Shorts

'ENGLISH ELECTRIC'

HAWKER AIRCRAFT LIMITED

RUBBER PRESS DIES, HUFFORD AND ALL STRETCH PRESS TOOLS, ROUTER TEMPLATES, JIGS; DRILL, SPINDLE AND ASSEMBLY.

USED THROUGHOUT THE AIRCRAFT INDUSTRY

HORDERN - RICHMOND LIMITED, HADDENHAM, BUCKS, ENGLAND

Telephone: AYLESBURY 1100-1102. *Telegrams: WINSTIX AYLESBURY*

SEEKING St. AUBAN'S STANDING WAVE

Experiences of an R.A.F. Gliding Association Party During an Expedition in France

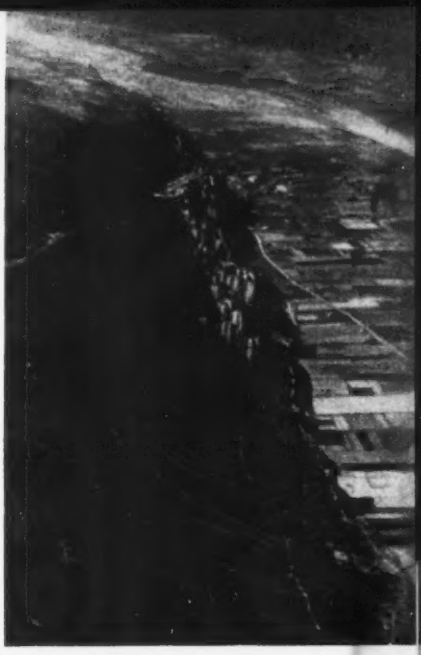
IT is the ambition of every gliding enthusiast to fly in a "standing wave," that meteorological phenomenon which, though capable of producing the most satisfying results, is not yet fully understood. Earlier this year a party of members of the Royal Air Force Gliding and Soaring Association visited the gliding school at St. Auban, where one of the most famous "waves" may often be relied upon to perform. They have jointly contributed the following informative account of their experiences.

ONE of the declared objects of the Royal Air Force Gliding and Soaring Association is to take part in meteorological investigations, for it believes that there is no pilot, however experienced, who cannot by practical experience in a sailplane learn something new about the element through which he flies. It was with this object in view that the Association paid a visit to the famous French soaring school at Saint Auban-sur-Durance, in the Lower Alps.

The expedition consisted of G/C. G. J. C. Paul, D.F.C., the chairman of the Association, W/C. W. H. Ingle, A.F.C., and S/L. A. R. Williams. With their own sailplane, a Weihe, a trailer and a towing vehicle, they left England by cross-Channel ferry for Dunkirk on March 19th last. In addition, a considerable quantity of equipment, such as recording barographs, was also taken, as well as camping equipment, which latter it was intended to use, if conditions permitted, in order to minimize expense.

The expedition arrived in Paris at 1700 hours on the following day, with the intention of calling at the British Embassy; the intention was frustrated, however, owing to the strike on the Métro and the resulting traffic congestion in Paris, indicated by warning notices saying "Circulation très difficile." After a somewhat emotioning passage through the "circulation," the fifty-foot-long combination of vehicle and trailer was spewed up by the maelstrom still intact (except for an overheated clutch and temporary loss of bottom gear) on to one of the ring boulevards. The journey then continued on the road to Fontainebleau, and an overnight halt was made about 20 miles south of Paris, where the clutch recovered and bottom gear was restored.

The following two days were filled with grievous trouble from the towing vehicle, which finally, on the evening of March 22nd, came to a standstill in Lyon with a stripped gearbox. In the end, the party left by train for St. Auban, intending to collect the vehicle and sailplane as soon as repairs were completed. Difficulties were accentuated by a rail strike and Easter, a combination which resulted in the journey being completed in a crowded four-wheeled baggage van swaying uncomfortably behind the only train of the day. The final arrival at St. Auban Airfield, in the early morning of Easter Sunday, was made on foot. At this point we learned that whilst we were stranded in Lyon, St. Auban's famous standing wave had been working, and that heights of 24,000ft had been attained!



Dramatic topography of the Penitents Slope. The Penitent Rocks are in the centre and the Durance River can be seen in the background.

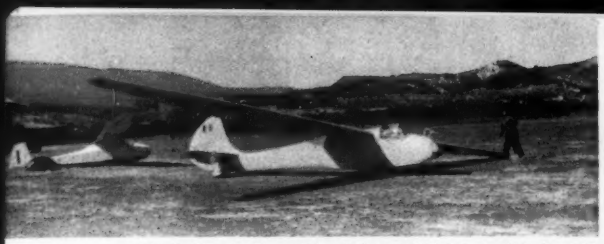
Easter Sunday and Monday were both non-flying days; but on the following Tuesday the chief pilot of the Centre, M. Gaudry, returned to duty, and his efficiency and goodwill made short work of our difficulties. He not only immediately despatched one of his own vehicles to Lyon to fetch our sailplane in its trailer, but also permitted us the use of one of his powered aircraft, with which we were able to make a thorough aerial examination of the locality. The following morning (at about 0300) the R.A.F.G.S.A. sailplane arrived, and from then on we were able to make flights in our own aircraft. In addition, we were allowed to fly the aircraft of the Centre, so made flights in the French-built Weihe, and also in the French-designed and built Arsenal Air 100, whose handling qualities we decided were probably superior to those of any other high-performance sailplane yet flown by members of the Association.

The arrival of our own aircraft coincided with that of a party of Danes, led by Mr. O. Jespersen, who had driven non-stop from Copenhagen. They brought with them a most interesting aircraft, a Swedish-built Olympia converted by themselves into a pod-and-boom glider, with squared-off wing-tips. It appeared to have an improved penetration as compared with the ordinary Olympia or Meise. The Danish party proved delightful companions and a fine cameraderie was soon established between them, the French instructors, the French pupils, ourselves, and, of course, Guy Borgé. M. Borgé is not merely a personality in French gliding—he is an institution. Apart from holding a Gold C and Diamond, he contributes regularly to dozens of periodicals, and has probably written more about gliding (in English as well as French) than any other person living. His earnestness and open sincerity made him a fine target for everyone and, since we know he reads each issue of *Flight*, perhaps we might take this opportunity to apologise publicly to him for ragging him so unmercifully.

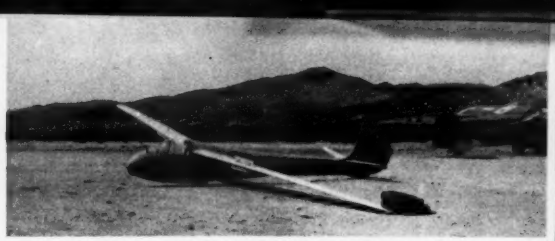
The part of the Durance valley in which St. Auban lies runs

On the way to St. Auban with the trailer: Repairing a puncture—one of many—near Paris.

On the airfield at last, and ready to fly: S/L. Williams and G/C. Paul with the R.A.F.G.S.A. Weihe at St. Auban.



The Air 100, an advanced French design which impressed the Royal Air Force party very favourably.



The Arsenal 4111, a French experimental all-metal sailplane equipped with oxygen, heating and heated pitot-head.

SEEKING St. AUBAN'S STANDING WAVE . . .

north and south. The outstanding features of the whole area are the Lure Mountain and the Penitents Slope. The Lure is a slightly concave ridge facing north-west on the west side of the valley, the top being approximately 3,600ft above the valley floor. The Penitents Slope (it would rank as a mountain in England) also faces north-west, but is situated on the eastern side of the valley; the top is 1,300ft above the valley floor. The airfield is situated about in the centre of the valley, six miles from the Lure Mountain and 1½ from the Penitents. Except for the Durance River, most of the valley is broken ground covered with scrub. From the gliding point of view an item of further interest is a large factory adjoining the airfield, which, apart from manufacturing chlorine, produces, also, very good if somewhat smelly thermals!

The airfield has a maximum length in the direction of the prevailing wind of 1,200 yd, and is all grass. There are three permanent hangars, and domestic and administrative buildings, which, whilst far from luxurious, are adequate.

Aircraft equipment consists of 35 gliders and sailplanes, mostly of high or medium performance, and all capable of extended soaring flights. All high-performance sailplanes are fitted with oxygen equipment, and two with special forms of cockpit heating. Tugs are three Fieseler Storch aircraft (Morane-Saulnier-built) and, in addition, there is an assortment of small powered aircraft used by the instructors and for communication purposes. M.T. consists of seven vehicles of various sizes, and two winches.

Last year the Centre completed 5,100 hr of motorless flying with this equipment, having taken in 20 courses of 25 pupils each, and given each pupil between 10 and 12 hours' flying, including dual. By the time a pupil has completed the course he is likely to have done about 50 to 100 hours and, if necessary, would be capable of proceeding, with very little additional instruction, to advanced flying training on military aircraft.

The outstanding point about St. Auban is that it is in the direct track of the Mistral, the strong, stable wind that blows down the Rhône Valley. It is most often associated with an anticyclone over the Atlantic and another over Russia, causing a northerly flow over France of cold, stable air, which is apparently funnelled by the Rhône and subsidiary valleys in to the east, most of which also run north and south. When the Mistral is from the north, good lift occurs on the Penitents Slope up to a height of 3,000ft—that is, up to three times the height of the slope, as is normal. We found that under northerly wind conditions the Lure Mountain produced practically no lift, because its concave ridge faces north-west. In the same circumstances, the valley itself produced a strange mixture of rapidly alternating lift and sink in such a way that experienced pilots could stay apparently indefinitely at 3,000ft over the middle of the valley, facing into wind. This was no doubt due to the fact that the valley suddenly narrows a few miles north of St. Auban.

We found that the wave-producing Mistral has to blow from the north-west; that is to say, normal to the concave Lure ridge, and this happens comparatively rarely. For the Mistral to blow from this direction with any speed, there would normally have to be an anticyclone off Portugal, a depression over Norway and a secondary depression over the Gulf of Genoa. Under these conditions, the air is then triggered into a wave by the Lure Mountain and eddies from it produce a marked roller cloud immediately to leeward. When this occurs, the lift on the Penitents Slope, which is seven and a half miles away downwind, remains unaffected except at a great height. There have been many occasions when inexperienced glider pilots have used the slope lift to the best advantage and have reached sufficient height to penetrate the wave. One such case occurred whilst we were there, and an 18-year-old pilot reached more than 12,000ft on a day when there was thought to be no wave. We were told that on other occasions, when a strong north-west wind has been blowing, there has been no wave effect on the mountain but a complete wave covering the slope, so that pilots over that slope have found themselves in the wave without effort. However, the heights obtained in this way have in no way compared with those attained in the Lure Wave.

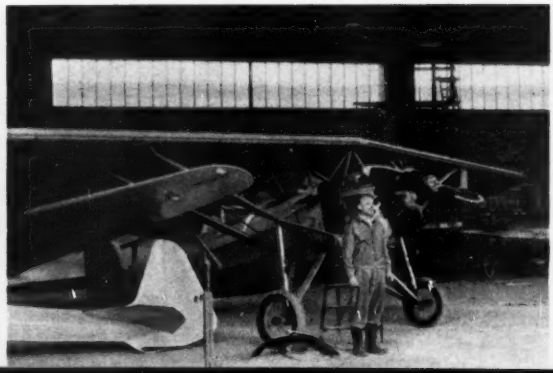
The conditions of flying in the wave were identical with those experienced in Germany, and exactly the same as reported experiences of flying in the Helm Wind and the Long Mynd wave in this country. On approaching the wave, violent turbulence was experienced which stopped completely when the glider came fully under the influence of the wave and began to ascend. As long as one remained in the wave, the air was very smooth and produced the strange humming or singing noise which has been reported of all waves. The following account of a flight in the wave, by a U/T. pilot member of the expedition, with a French instructor, M. Lafargue, gives an excellent idea of conditions. (The member in question, not a qualified power pilot, had 1 hr 30 min dual gliding and 9¼ min solo in his logbook.)

Personal Experience

The met. experts (he writes) had predicted wave conditions for the forenoon, but no pilot had been fortunate enough to find anything except very rough air. Lenticular clouds were visible throughout the day, but gradually faded, and none existed at the time of take-off. Cu-nim clouds stretched across the sky westwards of the airfield, and my instructor, pointing to the heaviest concentration of them towards the north-west, prophesied a storm.

Our aircraft was a C.800 two-seater, in which pupil and pilot sit in echelon, the former on the port side, about two feet forward of the instructor. The arrangement is admirable, since the instructor remains out of the pupil's vision unless the latter looks sharply right, while the former can observe and discuss everything with ease. In my case instruction was given in French, generally within the limits of my comprehension, though sometimes gesticulation supplied gaps.

The flight started with an aero-tow given by one of the hard-worked Fieseler Storchs. It was my second aero-tow, and the first on which I took control from the beginning. We wobbled our way up in a strong, gusty wind, the sailplane generally anywhere but in the correct position to the tow. My instructor occasionally advised me—"More up, my friend," or "More down if you like"—until, fed up by being banged about for eleven minutes, he took over. The difference was not so marked as I had hoped, nor was he able, as was the case in a previous flight, to place the sailplane at exactly the position he wished. It was, in fact, as he said, a very bad day for flying and, since conditions seemed to be worsening he decided at 1,300 metres to cast off. In less than ten seconds later all turbulence ceased. We had reached a standing wave. I took over again in conditions of absolute calm; the aircraft was flying towards the north-west and we rose rapidly, then moved slightly backwards over the ground. Occasionally a vibration made



(Extreme left) St. Auban's chief met. officer discusses the day's weather with M. Gaudry (in beret), the C.F.I.

A Morane of 1926 vintage, still fully serviceable and occasionally used for towing gliders. Standing smartly at attention is W/C. Ingle, one of the R.A.F. party.

the sailplane quiver slightly, otherwise only a deep and irregular pulsation marred its perfect steadiness in flight.

At 2,000 metres we approached some faint, rolling cloud which formed and disappeared rapidly. Still we rose, making our flight through intervals of cumulus riding at 2,000 to 2,500ft across the sky—the storm clouds to which we had looked when on the ground. We flew in wide ellipses, seeking the best lift; at its maximum it had been 5½ metres a second but generally it was between 2½ and 3½ metres.

At an indicated 5,000 metres the altimeter stuck. Improvised repair action by the instructor—consisting of kicking the panel, beating the clock face and cursing it—was ineffective. The variometer still showed a lift of 2½ metres and for a few minutes longer we rose. We estimated our height to be about 5,500 metres.

"Down," said the instructor, and showed me the spoiler mechanism. I pulled until it was half way open, but with no visible effect upon the variometer. Furious gesticulations followed. "You shall augment the pique," said my companion, and I pushed the stick a little forward, and more forward, and yet more forward. For the first time in nearly three-quarters of an hour the variometer was at equilibrium but my left hand was numb, partly from cold but more from the strain of holding the spoilers open. Then I saw the catch at the end of the arm and, pulling it home, locked the spoilers fully open. We slid downhill comfortably for ten minutes, passed through the cu-nim, left the wave and were then banged about in the roughest air I have yet experienced; at one stage I thought we might end up with the aircraft on its back. We had come out on the edge of the wave where the air was itself spinning downwards. Soon, at 1,500 metres, we left the worst of it and took stock of ourselves. There was no cloud to indicate a wave, only the cu-nim umbrella somewhere above the beginning of where we knew the wave began. The instructor spoke of the dangers of remaining at high altitudes overlong; we looked for the expedition's Weihe which we imagined must be far above us. I felt elated at the experience and realised that my hands were very, very cold.

Irresistible Attraction

There is no urgency about height at St. Auban, since there is nearly always hill lift somewhere. A few single-seaters were below and nearly astern of us over the Penitents—jagged rocks eroded from the mountainside. Irresistibly drawn to the wave, we climbed again, retracing our former path. We had left the wave at about 2,500 metres : we regained it at 1,700 and this time the instructor flew the sailplane. We left the wave at its northern edge and sought another beyond the tip of the mountain four miles away. The variometer showed an increasing rate of fall, with a maximum of 5½ metres; the tip of the mountain, with its snow-cap, passed slowly beneath us and we saw the dark precipice of its northern face. Still we lost height in bumpy air, and I cast anxious glances at the precipice and looked towards the opening of a transverse valley along which I assumed we might escape.

"There *must* be a wave," said the Frenchman, but we did not find it; and half a minute later we swept back above the precipice, over the snow-cap and set course for home. We were much lower this time and the area of turbulence was less marked. At 1,000ft we turned into the circuit and I took over again, using the spoilers to help the descent. On instructions, I pushed along a broad valley terminated by a magnificent Roman ruin. We should have lost height, but we did not; instead we found another wave, though weaker than the first and giving only two metres rise per second. Quietly we moved up the valley in the growing dusk. At length, when about three miles north of the field, we turned and, using full spoilers, flew to the circuit. There were no other aircraft about. For five minutes we lost height, then I handed over and the aircraft was brought in beautifully, running to within fifteen feet of the hangar doors. We had been in the air for 2 hr 28 min, of which 2 hr 18 min had been in free flight.

So much for a first encounter with a standing wave. The greatest rates of climb recorded in the St. Auban wave have been 39ft/sec

A good example of lenticular cloud which appeared over the valley on a day when the wave was present.

at comparatively low altitude, decreasing evenly to zero at the top of the wave. This rate has been recorded on many occasions, but never exceeded. Apart from wave lift, the valley produced on every day of our stay consistently good thermals (even in March) of wide area and up to the level which would normally be expected from inspection of the tephigram for that day. This thermal originated directly from the chlorine factory already mentioned. The position of the factory is such that, when the normal Mistral blows from due north, heated air from the building strikes the Penitents Slope, giving a narrow band of abnormally good lift. This, an effect frequently met with in gliding, is usually referred to as "thermo-dynamic lift." "Evening thermals" are also common in this valley, when the rapidly cooling air surrounding the mountain-tops in the evening pours down into the valley, displacing warm air, which rises in the form of a very wide, even thermal. On one particular evening at St. Auban this was very marked, and some 17 gliders remained over the middle of the valley for several hours at a constant height of 5,500ft.

The meteorological section at St. Auban consists of a well-equipped hut with two fully qualified forecasting officers employed by the French Central Meteorological Organization. The junior of the two is a keen glider pilot of some experience, and the senior one flies occasionally. The two officers devote practically their whole attention to the study of local conditions, and they have amassed and forwarded to Paris a very considerable amount of study-material regarding standing waves. In fact, it seemed to us that the French Meteorological Office must by now have more information on standing waves than any other organization in the world, and we were most impressed by the efficient manner in which these records are maintained. Of particular interest were two large forms : one was used to cover all flights occurring on any selected day which was of particular interest, and the other was for giving all details of particular flights. Full details of the flights and the prevailing meteorological conditions were recorded on the same form, the debriefing of pilots being carried out each evening by the junior officer.

As an example of their thoroughness, it was not considered sufficient to reproduce on the form only the barograph trace of the glider; they insisted upon working out from the trace all rates of climb and descent and quoting them alongside the air speed flown at each particular moment. Knowing the flying characteristics of each type of glider, it was therefore a comparatively simple matter to obtain by inspection the real vertical and horizontal velocities of the air itself.

It appeared that the meteorological officers of St. Auban subscribe to what may be called the inversion theory. This supposes that the prime necessity for a standing wave is a marked inversion, which produces a discontinuity level, i.e., a level which separates two layers of air of markedly different density. Waves then occur, with high wind speeds, because the denser air of the lower level, having been thrown above the inversion (by, for example, a mountain range) curls over and re-descends below the inversion; a series of waves is thus set up.

The St. Auban met. officers' views led to valuable and enjoyable debates, since our own theories were not in agreement. For example, on one particular day the upper air ascent showed that there were three very slight inversions, at approximately 6,000, 12,000 and 20,000ft. According to the inversion theory, there

St. Auban Airfield from 4,000ft. In the foreground is the Chlorine factory, which provides delicately scented thermals.

The Danish party's Swedish-built Olympia, which they had modified with success into a pod-and-boom aircraft with squared-off wingtips.

SEEKING St. AUBAN'S STANDING WAVE . . .

should have been three separate waves; yet on that day the *Chef Pilote* and the holder of the present French altitude record climbed to 26,000ft in the wave in perfectly smooth lift which started at 10 m/sec at the bottom and decreased evenly down to zero lift at the top of the wave; there was no suggestion of three separate waves being marked.

It appears to us that this inversion theory may not be the best explanation; recent theories demonstrate mathematically that even the most marked inversion which occurs in practice can hardly be considered a discontinuity layer, because the difference in density below and above the inversion are far too small to be compared, for instance, with the discontinuity of density at the surface of water. The change in density would be at most 3 or 4 per cent. Scorer has produced a formula for wave amplitude which shows that there are other items which have a far greater effect. According to him, whether waves take place or not depends upon the relationship between a parameter which is a function of the static stability (the differential of the potential temperature with respect to height) and a differential of the wind speed with respect to height. In other words, waves depend upon stability together with an increase of wind with height. It can be shown that, normally, a suitable lapse-rate has far less effect than increases in wind speed. It is pointed out that the density changes at an inversion by at most 3 or 4 per cent, whilst the velocity of the wind may change in quite a shallow layer by 100 per cent or more. It seems, therefore, fairly certain that a rapid increase in wind with height is more likely to be the deciding factor in causing waves, and although it was not possible for us to take copies of all the very extensive records maintained by the French at St. Auban, it certainly appeared on inspection of them that Scorer's theory is correct. It also explains why, at Scharfoldendorf in Germany, standing waves appear repeatedly at a level in the mountains which is well above the inversion layer. In other words, the inversion reported on ascents done from valley stations is below ground level at Scharfoldendorf.

• • •

The party left St. Auban on April 2nd, the Centre again providing transport back to Lyon, where the R.A.F.G.S.A. towing vehicle was collected. The party left for the north on April 4th, driving continuously for thirty hours, and thus reaching Versailles on the evening of the 5th.

On the following day, a visit was paid to the British Air Attaché in Paris, and also to M. Fournier, head of S.A.L.S. (the French light aircraft and soaring organization) in order to thank him officially for his own kindness and hospitality as well as for that shown to us by all the staff at St. Auban; we found him a most friendly and understanding enthusiast, keen to further co-operation between British and French gliding.

After a further all-night drive, much of it spent in effecting continual repairs in the darkness and rain, the party reached Dunkirk at 1800 hr on April 7th, and were duly disembarked from the ferry into the hands of the British Customs officials in the early hours of the following morning.

SNOW-CLEARANCE

Swiss-designed Unit for Civil and Military Uses

THE problem of clearing snow from open spaces, whether airfields, skating rinks, or roads, is a regularly recurring one in Continental countries, and is even more acute in such territories as Alaska and Canada. In Switzerland a lengthy series of tests and experiments has been undertaken by the Snow and Avalanche Research Institute with the object of discovering the best and most economical method of moving snow, and one of the most effective means has been found to be a combination of two mechanical units. The first is a large cutter with blades which at each revolution detach a certain quantity of snow from the main mass and pass it to the second, a turbo-blower which discharges it in any required direction. The principle itself is not, of course, new; large "snow-blowers" have been used for many years in North America.

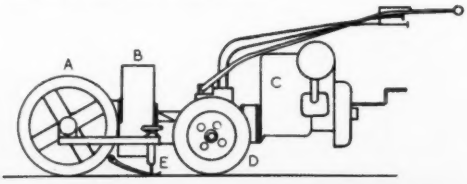
Machines embodying this principle, perfected by Dr-Ing. Bucher, formerly director of the Research Institute, are made by the firm of Robla A.G., of Merkuurstr. 34, Zurich, and are now in operation on military airfields as well as for civil uses. As will be seen from the diagram, the machine consists in essentials of a rotary cutter A, a turbo-blower B with engine C carried on a pair of double road wheels D, which, like the snow-moving units A and B, are driven through suitable gearing. The skids E are more especially useful when highways have to be cleared, as they enable the cutter blades to be set at a suitable height in order to clear the highest stones composing the road. The power unit is a 465 c.c. air-cooled petrol engine fitted with a special type of air filter for snow dust. As the outfit was designed originally for Switzerland, it is amply powered for the work it has to perform in view of the fact that a decrease in power output in the order of 10 per cent per 1000 metres altitude has to be taken into consideration.

From the engine, the drive is taken through a gearbox with oil-immersed gears giving six forward clearance-speeds of 396, 1,023, 1,914, 1,498, 2,523, and 4,780 yards per hour respectively, and two reverse speeds of 386 and 967 yards. The cutter, which cuts, pulverises, and passes the snow into the blower, is 2ft 9in wide, with eight spiral blades and four speeds of 498, 840, 1,240, and 2,100 r.p.m. respectively. The housing of the blower immediately behind this cutter is adjustable about its axis so as to discharge either to the right or left hand and at any desired angle, the most effective inclination being some 55 degrees.

Output naturally varies according to the condition of the snow which has to be dealt with, varying from 10,000 cu ft/hr up to as much as 17,000 cu ft/hr in the case of a new fall, and the snow is discharged over distances of up to about 60ft on either side. With hand removal, one man is usually assumed to be capable of shovelling from 150 to 280 cu ft per hour when loading a cart, whereas this mechanical unit will fill a five-ton lorry in three to five minutes.

In other seasons of the year, the cutter and turbo-blower can be readily detached and replaced by other attachments such as a mower, earth-moving devices, or even a small truck for the transport of heavy road-making tools.

Below is a Swiss Army A.A. battery dug-in with the aid of the mechanical snow-clearer, the principal units of which are seen in the diagram on the right. Below, right, is the machine in action.

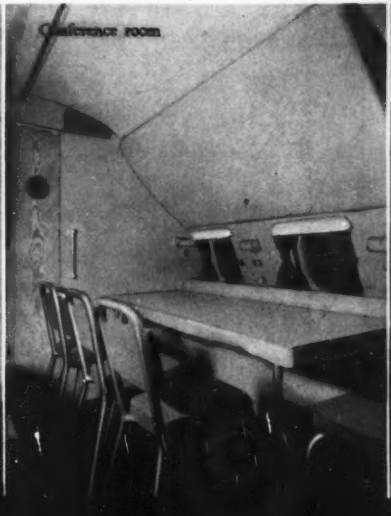


HASTINGS C IV

A high-speed V.I.P. transport in service with the Royal Air Force

HANDLEY PAGE

RADLETT LONDON READING



VANDERVELL
Thin Wall Bearings
SERVE ALL BRANCHES OF THE
ENGINEERING INDUSTRY
LTD
THIS MARK
ON ALL VANDERVELL
PRODUCTS
VANDERVELL
PRODUCTS LIMITED
WESTERN AVENUE PARK ROYAL LONDON W3

Power-operated Flying Controls

Part II: Methods of Duplication to Guard Against Failure: Some Current Designs Described

By R. WESTBURY

THIS review—the first part of which we published last week—deals with a subject of increasingly great importance in the design of large and/or high-speed aircraft. In Part I, Mr. Westbury—who is a member of the technical staff of H. M. Hobson, Ltd.—discussed requirements and basic principles; here he goes on to review safeguards against failure and to explain the duplication of units. Hydraulic motors are also described.

THE systems so far described are all single units and must be regarded as being fallible in a number of ways. For safety they must be, at the least, duplicated in a manner such that no possible form of failure of one unit will have any dangerous effect on the control characteristics of the aircraft. In most cases some reduction of control power will be permissible, either in the form of lower rates of control movement or of smaller control-hinge moments.

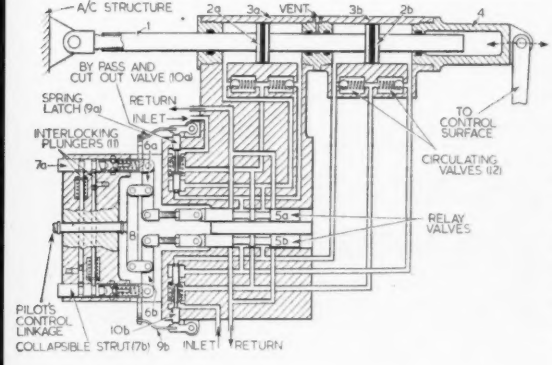
Two basic methods of duplication exist: in the first, two units operate in unison, sharing the work equally. The problem to be faced when a failure occurs on one side is that of ensuring that the failed unit will in no way obstruct or influence the remaining unit. In the second method, a main unit is operating continuously and provides the normal control whilst a stand-by unit is waiting to be brought automatically into action immediately any failure occurs.

Employing two units in continuous co-action appears to offer advantages in weight and reliability because, (a) both units are normally working and sharing the load, and (b) if one side fails, the other is already in use and the problem is merely to ensure that the faulty unit can drop out without obstructing the sound one. With the main and stand-by method it is necessary to initiate, automatically, instantly and infallibly, a sequence of events which will bring into action a unit which has been inactive for prolonged periods.

Possible Causes of Failure.—Directions in which failure may occur can be listed as: (a) Loss of fluid and/or fluid pressure; (b) in electrically driven systems, electrical failure; (c) jack seizure; (d) control-valve or other input seizure; and (e) mechanical failure.

Of these items, (e) can be ignored, because the risk is of the same order as in manual control systems, and (c) can in many cases be discounted; though there may be aircraft on which it is preferred to provide alternative operation in the event of a seizure of a powered-control jack, whether ram or screw type. Alternative operation in these cases is provided either by using divided control surfaces each with its own powered control, or by employing two or more jacks differentially coupled. The remaining items are all forms of failure which should be taken into account and safeguards provided.

Fig. 5. Duplication by two jacks in tandem on common piston-rod.



So far, it has been the writer's object to present a general picture of the various known methods of powered-control operation and duplication. As mentioned in the introduction to Part I, H. M. Hobson, Ltd., are producing both power-assisted and duplicated power-operated controls for several new aircraft types; the main features of these controls may now be briefly described, and their principal features selected for review.

Hydraulic Piston-jack Type.—In all cases this type is being used to operate control surfaces which are mass-balanced and which are not subject to aerodynamic overbalance. It is not necessarily true that the simple hydraulic jack is unsuited to the operation of non-mass-balanced controls, but there are considerable difficulties involved and much work has still to be done before it can be said that such a system would be safe.

Fig. 5 shows one form of duplication in which two jacks are arranged in tandem on a common piston-rod. This arrangement is functionally similar to two jacks in parallel with their outputs connected to a common member. Referring to the diagram, it will be seen that a piston rod (1), carries two pistons (2*a*, *b*), slidable in cylinders (3*a*, *b*), which are attached to tail tube (4) and thence to the output member.

The piston jacks are controlled respectively by relay valves (5*a*, *b*), slidable in guides formed in an extension of the body of cylinder (3*a*). Each relay valve is connected to one end of a differential link (6*a*, *b*), the other end of each link pivoting upon collapsible ball-catches (7*a*, *b*). The centre of each link is connected to a yoke (8) which slides both valves in unison in response to input motions. The ball-catches retain spring-catches (9*a*, *b*), which hold down valves (10*a*, *b*). These valves, when released, shut off the fluid supply to each piston jack and, at the same time, interconnect opposite ends of the cylinder. They also act as pressure-relief valves in the retained position.

The yoke (8) carries two collars which serve as stops to limit the travel of the relay valves and react against input force in excess of the valve operating load. Seizure of a valve causes this reaction to be transferred to the ball-catch, thus releasing the spring-catch and the by-pass and cut-off valve. As a precaution against inadvertent operation of a ball-catch after one has already operated—which would result in complete loss of control—the ball-catches are interlocked by means of plungers (11) so arranged that operation of one will positively lock the other. In the event of the remaining valve seizing it is preferable to attempt to free it by excess manual force rather than to incur a loss of control of one surface.

At small rates of movement, discrepancies in valve positioning can result in pressures in excess of line pressure being generated in one cylinder, and valves (10*a*, *b*), each acting as a pressure relief, prevent this.

Should one pressure supply fail, the remaining operative jack will motor the failed jack, fluid passing from one end of the cylinder through the circulating valves (12) and thence through the relay valve to the other end of the jack.

It will be seen that failures due to loss of fluid pressure and to valve seizure are fully safeguarded. Continuously co-acting jacks have been chosen for the reasons of efficiency and reliability already outlined. An alternative to parallel or tandem connection of the two jacks would be to couple them differentially or in series, each of these arrangements being functionally similar. The difficulty with this method is that a failure must cause the relevant jack to lock, whereupon it immediately becomes a fulcrum-point for the sound unit and the whole onus of safety is then dependent upon the reliability of the lock. Furthermore, if it is desired to maintain the full angle of control following failure of one unit at an extreme position, a jack stroke three times as great as that normally used must be provided.

POWER-OPERATED FLYING CONTROLS . . .

The chance of a valve seizure occurring is probably very remote; nevertheless the consequences of such an event would be so serious (the control could, of course, move to an extreme position) that some safeguard is essential. If in five years' time it can be said that the powered control valve has never been known to seize on any aircraft, then the complication of the break-link device can, perhaps, be eliminated.

The construction of the jacks is robust, and seal design is such that over a million operations have been completed without a change of seals. By precision in manufacture, and careful attention to balancing, valve operating loads, other than those as a result of seal friction, are kept down to a maximum of 4 oz, while seal friction adds a further 1 lb to the operating load. It has already been mentioned that

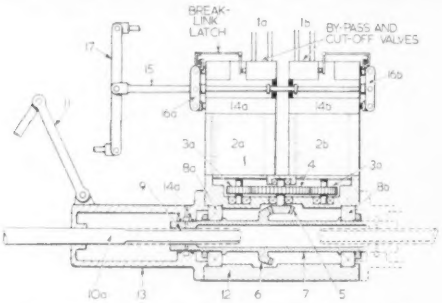


Fig. 6. Screw-jack unit for operation of non-mass-balanced surfaces.

reduction of these loads to the minimum is of great importance if rough, lumpy control operation is to be avoided.

Hydraulic Screw-jack Type.—Fig. 6 may be taken as a typical unit of this kind, suitable for operation of non-mass-balanced control surfaces (i.e., in cases where the powered control is required to provide an extremely rigid anchorage for the control surface). It will be seen that two hydraulic power supplies (1*a*, *b*), from independent sources energise respectively two hydraulic motors (2*a*, *b*), the output shafts of which are coupled by pinions (3*a*, *b*) to a gear wheel (4) which in turn rotates a bevel pinion (5) engaging with bevel gear (6) mounted on rotatable hollow shaft (7) carried in thrust-resistant bearings (8*a*, *b*).

Engaging with threads (9) formed in the shaft (7) is a screw (10*a*) which is connected to the output member and hence to the control surface. The screw is designed with an efficiency of about 70 per cent. If necessary, the screw is prevented from rotating by nutcracker links (11). The motors, gears, nut-shaft and bearings are mounted in a body (12) to which is attached an extension (13) which forms a guide for the screw and also serves as a lubricant reservoir. It also forms a housing for glands (14*a*) sealing an annular groove formed about the outer diameter of the nut-shaft into which groove lubricant is forced under pressure, and thence through holes to the centre of the nut, so ensuring that the threads are well supplied with lubricant.

If two output members are required—e.g., to enable a control surface to be moved at two points—a second screw, housing and associated parts may be placed at the other end of the body. The body must be rigidly attached to the aircraft structure.

The fluid supply to the motors is controlled as regards rate and direction of flow by relay valves (14*a*, *b*) which are moved in unison by rod (15) and links (16*a*, *b*). The rod is connected to a differential lever (17) one end of which carries the input connection and the other end the follow-up link connection from the output.

As a precaution against valve seizure a break-link device similar to that used on the piston-jack types of control is incorporated. It will be noted that the two hydraulic motors are positively geared together and it is, therefore, essential that motor seizure should be impossible, since locking of the

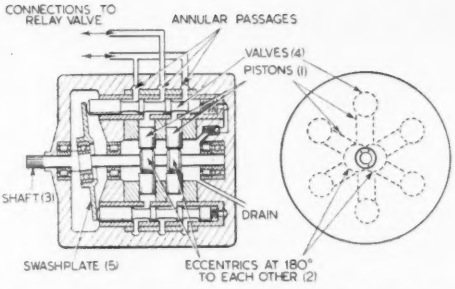


Fig. 7. General arrangement of twelve-radial-piston hydraulic motor.

complete power unit would then result. This factor has been borne in mind in designing the hydraulic motor shown diagrammatically in Fig. 7. Twelve radial pistons (1), arranged in two rows, engage with two eccentrics (2) on the main shaft (3). The flow of fluid to and from these pistons is controlled by six valves (4) sliding axially under the influence of a swashplate (5). Pistons and valves are mechanically unconstrained, so that seizure of any one does not obstruct rotation of the shaft. It might be argued that a piston could seize in the "in" position. The force available to move a piston to its outermost position, is, however approximately twelve times as great as the maximum inward force, and any seizure would therefore take place in the outward position.

An alternative method of coupling the hydraulic motors is to gear them differentially so that, if one is stationary, the other can still rotate the screw jack at half speed (it is, incidentally, characteristic of the parallel-coupling method that, on failure of one side of the duplicated control, full rate at half load is provided). As in the case of differential coupling of piston jacks, however, such an arrangement is open to criticism owing to the necessity for a "pressure off" brake of 100 per cent reliability; this, of course, increases complexity and weight.

Electrically-driven Units.—The piston-jack and screw-jack powered controls described are suitable either for use with engine-driven pumps or with self-contained electrically driven pumps. In the latter case a radial-type piston pump incorporating its own gear-backing pump is employed, providing an automatic variation of flow with pressure.

It has already been mentioned that the aircraft requirements often call for a high rate of control application at light or moderate loads (to meet the landing condition) and high loads at low rates (for high-speed flight). Translating these requirements into terms of a pump pressure delivery characteristic gives the result shown by curve (A) in Fig. 8.

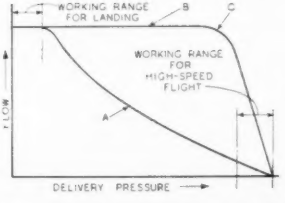


Fig. 8. Curves for pump pressure and delivery.

Ordinary engine-driven hydraulic general-service pumps have a performance of the type shown at (B), and it will readily be seen that this pump would require an excessive power to drive it when operating at point (C). In other words, considering the hydraulic system as a gear mechanism coupling an electric motor to the powered control output, the pump of curve (A) can change its gear ratio to suit the requirements, whilst the pump of curve (B) operates at a fixed ratio and the electric motor must, therefore, be capable of overcoming all output loads on this one ratio.

With the fixed-delivery pump some help can be obtained

from the use of a series-wound electric motor with a variable speed/torque characteristic. This is, however, not very advantageous, because it implies that maximum power output is developed at approximately half normal maximum r.p.m., and the size both of the hydraulic pump and electric motor is correspondingly increased. The electric motor for the pump giving curve (A) runs at, or near to, maximum speed when under full load.

The pump used in Hobson powered controls is shown diagrammatically in Fig. 9. A gear pump (1) provides a backing pressure for a radial-piston pump (2) with its spring-loaded inlet and delivery valves (3, 4). Interposed between the gear pump and the piston pump is a flow-regulating valve (5) arranged to move axially under the influence of pump delivery-pressure opposing a spring (6). At zero pressure the cylinders are completely filled during each revolution. As the pressure rises, however, the valve (5) is displaced against its spring and flow is progressively diverted from the plunger pump inlet to a return port (7) until eventually, at maximum pressure (3000 lb/sq in), the plunger inlet is fully closed and all gear-pump flow passes through port (7). At the intermediate flows the plungers complete only partial strokes.

It will be seen that, in general, the principle employed in providing duplication has been to use two units both normally working in unison so ensuring that, when a failure occurs, the faulty unit simply idles without being able to offer any obstruction. This principle has been followed as far as possible down to the smallest detail, and it has resulted in a system which is not dependent upon change-over devices either automatically or manually operated.

Some explanation of the choice of a valve type of control, instead of use of a variable-stroke pump, may be necessary, since, at first sight, the former offers inferior efficiency owing to the conversion of pressure energy into heat by turbulence at the valve ports when working at jack end-loads less than the maximum. It should, however, be remembered that, in this instance, efficiency is of importance only in terms

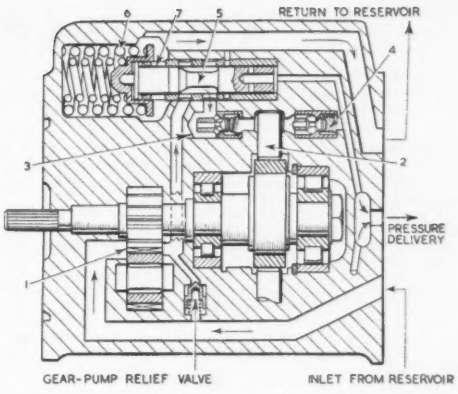


Fig. 9. Construction of pump used in Hobson powered controls.

of installed weight. It would be difficult to achieve a pump characteristic of type A (Fig. 8) in a manually variable-stroke design and, correspondingly, a heavier electric motor would be required which would offset any weight increase owing to the employment of the comparatively inefficient valve type of control.

Furthermore, the variable-stroke pump is of strictly limited application; it must, of course, be located adjacent to the jack and must therefore be electrically driven. Electric drive on a small aircraft undoubtedly imposes a weight penalty.

Finally, unless a low-powered intermediate servo is included, the forces to be provided by the pilot in disturbing the pump slide cannot be as light as the valve forces.

FOR WING-SURFACE SMOOTHNESS

Details of a New Checking Instrument Evolved by Vickers-Armstrongs

IT is well established that in the development of transonic and supersonic aircraft one of the major problems which has yet to be overcome is the prevention of early transition of the flow from laminar to turbulent, a phenomenon which is usually associated with waviness and various skin deformations of the wing.

A solution to this problem by producing wings with smooth skin finishes is almost impossible when it is realized that deviation from the design contour by more than 0.001in per 2in gauge length can seldom be tolerated. The use of thick skin has, to a certain degree, eliminated the corrugations that may be formed during certain flight manœuvres, but the problem of producing "dimple-free" surfaces has yet to be solved. The usual method of assessing the waviness of surfaces is to use an instrument normally consisting of an Ames dial or similar plunger-type micrometer mounted centrally between two fixed points. The micrometer readings do not give an absolute measure of the wave amplitude, but, provided the wave pitch is equal to, or greater than, the distance between the support pins, a close indication of the surface wave form may be obtained.

To perform this laborious process automatically, an instrument has been developed by Vickers-Armstrongs, Ltd., which, it is claimed, charts the surface waviness on graph paper in about 5 per cent of the time required by use of the Ames dial principle. The instrument takes a cylindrical form, the prototype being 2in dia. and 5.5in long. Three support pins are provided; the arrangement in plan is that each pin occupies a corner of an isosceles triangle, the base of which is 0.75in and height 2in (gauge length).

The exploring probe (which is situated half-way between the support pins) has a 0.1in nominal movement, while the internal mechanism is such that a 0.001in movement of the probe is represented on graph paper by any desired amount within the range of 1-2 mm. A 1in travel along the surface to be measured is represented by either 2.5 mm or 5 mm. The length of graph paper used is 400 mm (15.8in) and thus a total of either 80 or 160in can be represented on the charts. The casing of the instrument is hinged for loading the paper, and a window is provided for inspection to see if the instrument is functioning correctly. It is stated that the weight and contact loads on the probe are such that no harm to the skin results and the surface deflection is negligible.

The instrument has already been used extensively in production tests on aircraft wings and wing-panel stretching blocks. The time saved by its use was favourably illustrated in comparison with an Ames dial-gauge reading when measurement was made of waviness along transverse lines at 2in pitch on a block 324in by 36in. It was found that one man took 5 hr using this instrument as opposed to two men taking about 122 hr when using the Ames dial. It is estimated that a production model would cost about £100. In the forthcoming aircraft re-armament programme the use of such an instrument in production should substantially reduce time and labour costs and, in comparison, the initial outlay would be negligible.

RECORDS CONFIRMED

THE F.A.I. have announced the homologation of the 100 km closed-circuit record (world's absolute and Class C) of 1,023.039 km/hr (635.69 m.p.h.) established on August 17th at Detroit by Col. Fred J. Ascani in an F-86E.

Other records confirmed in the same announcement include the altitude record for light seaplanes in Class C.2b (600-1,200 kg), by Harold Mistele, who reached 6,148 metres (20,171ft) on September 3rd in an Aeronca floatplane (145 h.p. Continental) at Detroit; and a women's gliding record, Class D.1 (goal flight), of 364.035 km (226.2 miles) by Anna Samocadova (U.S.S.R.) on July 20th.

Model records confirmed include a world's absolute distance record of 356.794 km (221.70 miles) on July 22nd, also in Russia, and a control-line speed record, Class 1.C.2d, of 206.598 km/hr (128.37 m.p.h.) at Detroit on August 26th. In this case the model was powered by a Dynajet—a miniature but powerful pulse-jet.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Royal Transport

IT was most gratifying to see the great faith Princess Elizabeth and the Duke of Edinburgh have in air transport, as exemplified by their recent Atlantic crossing.

Although the aircraft employed for this journey was of a most reliable type, there were many who were dismayed to find that this country cannot, at the moment, provide an aircraft suitable for such an occasion.

In view of the visit which Her Royal Highness and her husband will be making to Kenya next year, is it too much to hope that the machine chosen may be a Comet, since this type will shortly afterwards be put into regular service to that part of the world? Such a step would do much to compensate for the use of an aircraft of foreign manufacture on the transatlantic voyage and, at the same time, would considerably enhance the prestige of the British aircraft industry—already of very high repute.

Harrow Weald. FRANCIS V. POUND.

Rearward-facing Seats

IT is significant that in Mr. Tye's R.Ae.S. paper on "Modern Airworthiness" [*Flight*, October 19th], half the author's remarks dealt with crashworthiness. It is obvious that for some time to come accidents will happen. Accordingly, the industry is under a moral obligation to improve crashworthiness requirements.

The introduction of major design-modifications such as low approach-speed characteristics in a high-performance aircraft is a formidable problem for which it would be hard to find justification in a world determined to live fast. But do passengers really object to hurrying with their backs to direction of flight? Some critics contend that they do. But, if we could converse with crash victims, they would be bound to state a preference for sitting back-to-flight rather than suffer mutilation and death.

The crash and ditching stations introduced in the R.A.F. and U.S.A.F. had, by 1945, proved the rearward-facing principle in practice. The truth was established seven years ago. Are we to continue killing passengers needlessly while we argue over the introduction of this simple modification? Further, the rearward seat is not a safety measure confined to the actual seat. If a passenger is in a rearward-facing seat he will often escape incapacitation and live to escape the fire and or drowning consequences of the crash by making his way out of adequate escape exists.

I am not alone in believing that available evidence has been accumulated to an extent which compels remedial action.

Godalming, Surrey. ROBERT BICKNELL.

Relative Safety

IN your report of the R.Ae.S. lecture by the Chief Technical Officer of the A.R.B. [*Flight*, October 19th], mention of the yardsticks for safety recalls a controversy in your columns a few years ago. The passenger-mileage fatality rate gives a convenient measure of the safety, but certainly not the final effects, of different modes of travel. Moreover, the favourable comparison of scheduled air transport with private motoring often obscures the very unfavourable comparison of private and scheduled flying with private and scheduled surface transport. Unfortunately, the air-transport fatality trend shows little improvement since 1945.

Since about half the accidents occur at take-off and landing, I submit that these should be measured against the number of *stage*-flights made. A publication of figures on this basis (as opposed to isolated examples) for landplanes, flying-boats, and helicopters would be valuable. I suspect that landplanes are considerably the most dangerous. The conventional horizontal ground run and its attendant low flying are inherently dangerous, especially for the crew. Although rearward-facing seats and crashproof tanks would be helpful, a more fundamental change seems desirable. Birds and insects can land vertically; in general, only water birds make take-off and alighting runs like flying-boats.

Accidents occurring *en route* are best measured against the mileage. It may be said that any navigation system which allows collisions is inadequate. Again, a natural analogy is found in bats, which avoid obstacles in the dark by sensing high-frequency sound reflections in a manner reminiscent of radar. Not a few *en route* accidents are due to forced landings, which would obviously be much safer if helicopters were used for overland routes and flying-boats for ocean crossings. Cases on record support this view. Journey speed need not suffer, since surface transport to aerodromes could be eliminated and recent developments include blended-hull turbojet flying boats and convertible helicopters.

The figures for take-off, landing, and *en route* accidents can readily be combined for different stage-lengths. Under present average conditions the accident rate is very high for stage-lengths under 100 miles. The use of accident data to estimate the probability of future accidents can be misleading unless it is realized that this means the probability in the light of certain conditions. Changing the conditions changes the probability—a point which is often overlooked.

Manchester, 19. G. R. BARRATT.

Naming the P.1067

MAY I express through your columns my choice of a name for the Hawker P.1067 jet fighter? I think that any one of the names "Hawk," "Warrior," or "Cobra" would be appropriate for such a beautiful and deadly fighter.

Belfast. R. ANDERSON.

Out of Place

WOULD you please inform your artist that a carrier or any other Naval vessel *never* wears a Union Jack at the stern? Your front cover picture this week [October 26th] is superb but for this very glaring mistake.

Fareham, Hants. D. M. HOUSTON.

THE very accurate representation of a light fleet carrier on the cover of your issue of October 26th, set in an artistic background, is rather marred by the inclusion of the Union Jack at the stern.

London, W.C.2. H. MALLESON.

[These and other readers who have commented on the advertisement drawing are, of course, right. When at sea, a carrier such as *Vengeance* would fly the White Ensign at the gaff. In port, the Union Jack is hoisted at the bow as soon as the ship brings up, i.e., as the anchor goes down or as the first wire goes out. In action, battle ensigns are hoisted at convenient points, e.g., at each masthead. If the Admiral's flag is already worn at the foremast, battle ensigns are hoisted at other masts or, if there is only one mast, at the gaff.—ED.]

FORTHCOMING EVENTS

Nov. 11. Air Transport Auxiliary Association: Presentation and Dedication of Vellum, St. Paul's Cathedral.
Nov. 14. Royal Air Force College, Cranwell: Rugby v. R.A.F. XV (home).
Nov. 15. R.Ae.C.: Film Show, Londonderry House.
Nov. 22. R.Ae.S.: "Problems of Trans nic Flight," by A. M. Clifton, B.Sc., F.R.Ae.S. (at Cheltenham).
Nov. 23. Helipcopter Association: "The Giant Helicopter," by O. L. L. Fitzwilliams, B.A.
Nov. 24. Society of Licensed Aircraft Engineers: Main Lecture: "Functioning of a Manufacturer's Servicing School," by D. W. Richardson, M.B.E., A.F.R.Ae.S.
Nov. 24. Royal Air Force College, Cranwell: Rugby and Squash v. R.N.C. Greenwich (away); Soccer and Rifle Shooting v. R.M.A. Sandhurst (away); Old Cranwellians Dinner (London).
Nov. 27. R.Ae.S. Section Lecture: "Aircraft Simplification v. Efficiency," by W. S. Farren, C.B., M.B.E., M.A., F.R.S., M.I.Mech.E., F.R.Ae.S.
Nov. 27. Society of Instrument Technology: "Visual Presentation," by K. F. H. Murrell, M.A., F.R.P.S.
Nov. 29. R.Ae.S.: "Structional Problems in Advanced Aircraft," by H. H. Gardner, B.Sc., F.R.Ae.S.
Dec. 1. Pathfinder Club Annual Ball. Dorchester Hotel, London.
Dec. 1. Royal Air Force College, Cranwell: Boxing v. R.M.A. Sandhurst (home).
Dec. 5. Royal Air Force College, Cranwell: Rugby and Squash v. R.M.A. Sandhurst (home).
Dec. 5. Royal United Service Institution: "The War in Korea, with Special Reference to the Difficulties of Using our Air Power," by W/C. P. G. Wykeham-Barnes, D.S.O., O.B.E., D.F.C., A.F.C.
Dec. 6. R.Ae.S.: "Air Intakes for Gas Turbines," by J. Seddon, A.F.R.Ae.S.
Dec. 7. Herts and Essex Aero Club: Annual Dinner and Dance.
Dec. 7. A. and A.E.E. Boscombe Down: Constructors' Dinner
Dec. 7. G.A.P.A.N.: Reception, Mansion House, London.
Dec. 11. R.Ae.S. Graduates and Students Lecture: "Naval Aircraft," by D. L. Hollis Williams, F.R.Ae.S.

FARNBOROUGH

S.B.A.C. DISPLAY

1951

The A.W. Meteor N.F.11

The Avro Ashton

The Avro Shackleton

The Avro 707

The Boulton Paul Delta P.111

The English Electric Canberra

The Fairey Firefly

The Gloster Meteor

The Hawker P.1052

The Hawker P.1067

The Hawker P.1072

The Short S.A.4

The Vickers Supermarine Attacker

The Vickers Supermarine 508

The Vickers Supermarine 535

The Vickers Valiant

The Vickers Viscount

all powered by

ROLLS-ROYCE

Aero

ENGINES

In the overcast—The advent of jet propelled aircraft on the world's air routes has emphasised the vital necessity of the precision approach. The new Marconi VHF direction finder, with its local or remote instantaneous presentation of sensed bearings on an 8" diameter meter, provides a unique contribution to the solution of this airport control problem.

MARCONI VHF D/F

MARCONI'S WIRELESS TELEGRAPH COMPANY LTD · CHELMSFORD · ESSEX

ANSWER to the PILOT'S PRAYER?

Trying-out the Decca Flight Log

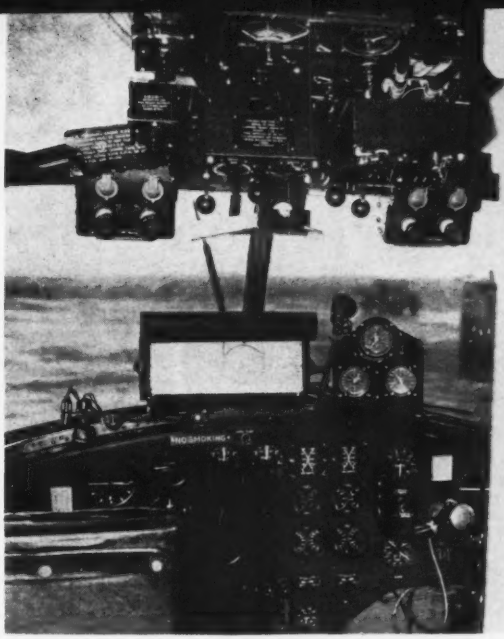
THERE can surely be few pilots who, at some point during the sweating penance which remorseless Link instructors innocuously term "S.B.A. practice," have not wished to be miraculously provided with some cockpit-borne indication of the path pursued by the Link trainer's "crab"—that misconceived invention which has such an infallible knack of turning the wrong way on to the beam, and such a propensity for leaving its unfortunate pilot to flounder in an interminable "twilight" zone.

The Decca Flight Log, it seems, may well be the means of their deliverance. Much has been written in the pages of *Flight* about the merits of the British Decca hyperbolic fixing system and a comparison made with the American-sponsored V.O.R. associated with D.M.E. International acceptance of either aid as standard equipment is still, unfortunately, the subject of international controversy. In this country, however, after a protracted period of professed scepticism, the M.C.A. eventually agreed to conduct extensive trials of the Decca system; and, having done so, it is now quite convinced that the latest Decca development, the automatic Flight Log, is in fact the answer to many of our existing traffic control and navigation problems. Versions of the Flight Log have been installed in various aircraft and subjected to intensive experiment.

Last week I had the opportunity of trying out for myself the latest version of the Log, the "01" unit fitted in R.M.A. *Rob Roy*, prototype of B.E.A.'s *Clansman*-class aircraft (Marathons). Associated with a Mk VII receiver, the equipment weighs 120 lb. I found the Flight Log conveniently mounted in the central position above the pilots' instrument panel. The three Decometers are located beside it for checking purposes and the lane-identification meter is found on the left-hand side of the cockpit. The latter unit has been developed to avoid any possibility of lane ambiguity and is also, I found, remarkably ingenious in the way in which it presents its information.

The Log itself is 12½ inches wide and contains up to 20ft of route charts, specially drawn to incorporate full information on ranges, marker beacons and airfields, but devoid of the normal topographical data. The aircraft track is recorded by a Perspex stylus which traverses a viewing aperture measuring 10 by 4 in. Charts of differing scale can be made up into rolls and stored in the display head itself. Should the aircraft cross the boundary of one chart on to another of different scale, a push button brings the new scale into operation. The charts now being used have been modified from those in use previously and are now almost on a conventional projection. The decometers themselves are set from the lane identification meter and the stylus can be set up on its correct starting point by positioning it at a lattice intersection shown by the Decometer readings (the lattice being printed on the reverse of the chart comes into view at the touch of a light-switch).

The lane-identification meter is mounted at the captain's left side.



(Below) R.M.A. "Rob Roy," the Clansman-class prototype H.P. Marathon with which the M.C.A. is now conducting evaluation trials on the Decca Flight Log. (Above) Located well within the normal field of vision of both pilots, the Flight Log and its three Decometers form a compact unit. The control box is positioned on the roof.

Selection of the appropriate zone and scale settings for the chart in use are made on the control panel, on which there is also a single knob by which, for setting-up purposes, the speed and direction of the stylus is controlled. In the air I found the stylus followed the aircraft's track with almost uncanny accuracy. Following a flight plan which involved the use of four-course ranges and 75 Mc/s marker beacons, it was literally possible to navigate the aircraft by steering the stylus, and although there is an initial tendency to overshoot when turning on to a new range course, a little practice will soon smooth such inaccuracies on the part of the pilot. One particularly useful gadget is the "time inject" switch; with it the flying of holding procedures is rendered easy by the fact that the stylus will, on selection of a desired interval, automatically record time marks.

During a G.C.A. approach to London airport, also, it was possible to check with the Log our actual distance from the end of the runway with that given by the talk-down controller. This flight, unfortunately, could only be a short one, and therefore only served to make me keen to try out the Log at greater length. To me it was nevertheless convincing proof that Decca and the automatic Flight Log must be carefully considered for the rôle of the major navaid on any but the long over-sea services. E.A.G.R.

CIVIL AVIATION

CITY TERMINAL: A general view of the well-appointed interior of Birmingham's first air terminal, located in the city's Civic Centre. It was officially opened by Lord Douglas of Kirtleside on October 30th.

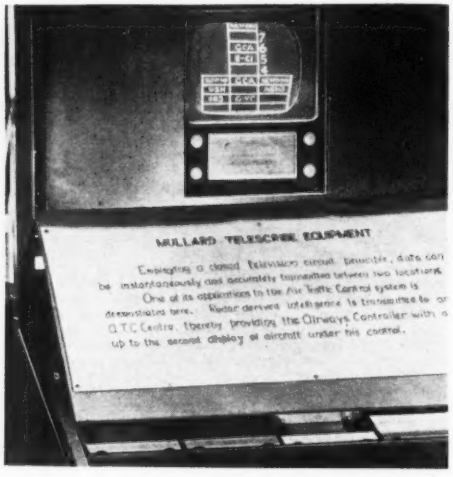
THE CORPORATIONS' HALF-YEAR PROFITS

IN a message to the staff of B.O.A.C. last week, the Corporation's chairman, Sir Miles Thomas, disclosed that operations during the first half of the current financial year had resulted in a profit of £974,000, leaving a clear surplus, after payment of interest on capital, of £133,000. This is in striking contrast to the overall deficit for the corresponding period last year of £2,228,000 and with the deficit of over £4,000,000 for the same period in 1949. The volume of traffic was maintained at a high level—particularly during August and September, when load-factors of 64.8 and 70.4 per cent respectively were achieved.

In September, revenue exceeded £3,000,000 in a single month, the first time in the history of the Corporation that this has happened. Despite rising costs throughout the world, B.O.A.C.'s improved efficiency resulted in a reduction of the cost per unit of output from 39.5d in 1950-51 to 38.0d in the six months ended September 31st. Sir Miles Thomas also referred to the very acceptable increase in revenue which derived from the improved mail rates which have been paid from January 1st by the G.P.O.

Although these results are encouraging and rewarding, Sir Miles Thomas emphasizes that B.O.A.C. is only half-way through its year and that there will, as usual, be a considerable falling-off of traffic during the winter months. In addition, B.O.A.C. is expecting to feel some adverse financial effects of the Abadan crisis which, it is thought at the moment, will almost certainly increase petrol costs.

B.E.A. also seem to have had a good year in spite of several adverse factors, such as cost-increases caused by recent wage awards, the introduction of the new Elizabethan class aircraft (from which no appreciable revenue has yet been earned) and a labour dispute which cost the Corporation some £150,000. But for these retarding factors, B.E.A.'s profit would have been £500,000. Nevertheless, a profit of £243,000 was finally achieved. During the half-year, 750,000 passengers were carried and the revenue total amounted to £6,500,000, of which only 7½ per cent (or £500,000) originated from the carriage of G.P.O. mail. Unlike B.O.A.C., B.E.A. have not so far reached an agreement with the Post Office to receive a more satisfactory rate of mail pay. The actual rate paid averaged 100.8d per ton-mile (2.5 gold francs per ton-km), which is one of the lowest rates in the world.



VIEWING THE STACK: This photograph shows how the Mullard Telescribe equipment, described on this page, presents information—in this case, data on stacking—to the viewer at the receiver screen. One unit is already being used experimentally at London Airport.

TRAFFIC CONTROL BY TELEVISION

ONE of the newest devices now in experimental use at London Airport is the Mullard Telescribe equipment which is being used by the Air Traffic Control Experimental Unit in an attempt to speed up the transmission of traffic information between the various units of the control organization. The Telescribe is a form of television apparatus by which written messages, tabulated information, maps, drawings and photographs laid down or written on a glass plate can be transmitted to a distant receiving unit. This intelligence is instantaneously reproduced on the screen of a cathode-ray tube.

This type of equipment would be particularly useful for exchanging information, for example, between the A.T.C. unit at Northolt and a Route Traffic Control Centre at Uxbridge, a few miles away. The value of using such a device for this purpose is governed by the fact that telephone liaison is apt to be too slow. Also, during peak traffic periods the lines may quickly reach their saturation levels.

The M.C.A. has already placed an order for a Telescribe set with which they intend to explore all the potential applications for transmitting information and even for relaying P.P.I. radar displays. A photograph of the experimental set at London appears on this page.

INDIAN OCEAN SERVICES

THE Australian Government has approved a capital expenditure of £A690,000 to recondition the war-time Cocos Island (Indian Ocean) airfield and provide facilities there for a service between Australia and South Africa. The Australian Minister for Civil Aviation, the Hon. H. L. Anthony, announced on November 1st that the service would probably begin next July.

An R.A.A.F. works squadron of 500 men will begin work shortly. Although the existing structures will be used as much as possible, a small village of prefabricated homes will be erected to house employees of the Department of Civil Aviation, Qantas Empire Airways, the Meteorological Bureau and the Shell Oil Company. Power-generating equipment, radio navigation aids, airport lighting, a telephone exchange, workshops and a marine base for air sea rescue launches are also planned.

The agreement with the owner of Cocos Island, Mr. John Clunies-Ross, will be signed in London almost immediately.

JAPAN RE-STARTS AIR SERVICES

OCTOBER 25th saw the inauguration of Japan's first post-war domestic airline service. Mention has already been made in *Flight* of the arrangement under which the company is operating. It involves the charter by a holding company, known as the Japan Airline Company, of aircraft and crews from Northwest Airlines. J.A.L. began its services with two Martin 2-0-2s, seating 44 passengers each, and on November 1st the fleet was augmented by a 69-passenger DC-4. Crews have all been supplied by

Northwest. The services now link three of the four main islands of Japan, the points served being Tokyo, Osaka, Fukuoka and Sapporo. Fares charged are not high when compared with those of the Japanese railways; they are, in fact, less than the total of the first-class rail fare with surcharges for sleepers and incidental expenses. Travel time between Tokyo and Osaka is reduced from eight to one and a half hours.

The sales side of J.A.L.'s business seems to have been handled with commendable enterprise, for tickets are available at 77 offices throughout the principal cities of Japan. Much of the credit for the successful organization of the new airline must go to Mr. Paul Ruston, formerly B.O.A.C.'s station manager in Tokyo, who was responsible for planning the company's organization a year ago. Mr. Ruston has expressed the opinion that the 2-0-2s which J.A.L. are using are ideally suited for the short-haul operations, but he feels that the number of aircraft being used will soon prove inadequate to handle the expected volume of traffic. He is confident that Japan has the advantages and facilities which will ensure the success of domestic, and later, of international operations.

As is to be expected, the beginning of domestic services will also tend to speed up local demand for international flights and, accordingly, Northwest Airlines are planning to introduce a regular Stratocruiser service to the Far East between Seattle and Tokyo on December 7th. The company already makes two flights weekly with DC-4s. Meanwhile Northwest have undertaken to run exclusively the operational side of J.A.L. until local personnel have been fully trained in the essential techniques.

As to the future, J.A.L. is likely to adopt a "wait-and-see" attitude until it is evident that public support is forthcoming. The company's aim is to become the actual owner of the aircraft, but this will have to wait until ratification of the Peace Treaty, under which the Japanese are not allowed to own or build aircraft, or to train their own aircrews. In this connection, however, it is understood that the Japanese Government has already made plans for immediate action as soon as the Treaty is ratified. Marked interest is also being shown in helicopters, which, because of the hilly terrain and lack of airfields in the country, are ideally suited for numerous duties.

It is reported, also, that the Douglas Aircraft Corporation has sent a team of five inspectors, headed by the former U.S. Assistant Secretary for Air, Mr. Harold C. Stuart, to inspect former Japanese aircraft plants with a view to working out a private licence agreement for the maintenance, overhaul and repair of American military and civil transport aircraft and engines. It is believed that the Boeing Airplane Company is making similar investigations.

Mr. Stuart has stated that, if the Douglas project is successful, Japan will, as far as possible, make use of her own resources in materials, labour and facilities.

From a preliminary report it seems that the ground is quite favourable for the Douglas project. The standard of technical and engineering ability of the Japanese companies is said to be high. More than half of the personnel who formerly worked on aircraft construction or maintenance are still employed in more than ten of the heavy industries, which until 1945 included the well-known Mitsubishi, Nakajima and Kawanishi aircraft firms.

The revival of domestic aircraft services, incidentally, has also brought about the inauguration of the first post-war airmail service.

Other news of aeronautical interest from Japan includes the fact that the Japanese Maritime Safety Board is planning to purchase six American helicopters to search for drifting mines in Japanese waters. Additional orders are also expected from other companies, who may use the machines for charter or agricultural purposes. In this connection, a possible demand for British helicopters is foreseen.

A small charter firm is also planning to carry out a number of sightseeing trips. According to its sponsors it will be known as the Tokyo Airline Company and, initially, will purchase three Cessna 170s from the U.S. Services are due to start as soon as the Peace Treaty is ratified. It is also rumoured that a number of privately built gliders are on the way.

BREVITIES

THE Bristol Aeroplane Company (Housing) Ltd., has contracted to erect a terminal building at Evans Bay, Wellington (New Zealand), within six months. It will give Wellington one of the most up-to-date flying-boat bases in the world. The building, which is said to be of striking design, will be of prefabricated aluminium.

* * *

Because of heavy demands in Canada for space on trans-Continental routes, T.C.A. will, for the first time in its history, maintain four flights a day on these routes throughout the winter.

* * *

S.A.S. has applied to the American C.A.B. for a renewal of its permit to operate to the United States. The previous permit, which had been held since 1943, expired in February, when the Swedish Government increased its interest in the S.A.S. to 50 per cent. The old permit stipulated that any change in ownership would call for its revision or renewal.

* * *

The New Zealand National Airways Corporation last year carried a record total of 250,000 passengers on its internal services without a single accident. This represents a proportion of one in every eight of the country's population—a higher air travel ratio than is experienced in Britain, Canada or the U.S.

* * *

Irving E. Sommermeyer, who has flown more than 15,000 hours for United Air Lines since he became a co-pilot in 1933, has been appointed their general manager of flight operations. Mr. Sommermeyer, who started flying with the U.S. Navy at Great Lakes, Ill., in 1930, has been an assistant flight manager at Chicago since 1947. In his new post he will have his H.Q. at United's Denver operating base.

* * *

For the second year in succession, the Australian State-controlled airline, T.A.A., has made a profit; its annual report, published recently, shows an operating surplus of more than £205,000. Passenger traffic rose by 15 per cent and it is claimed that revenue would have been considerably higher if more aircraft had been available to handle the traffic offering. An interesting comment on the changing economic conditions in the world is that the company's fixed assets of £2,180,000 have a present-day value of £3,920,000.

* * *

More traffic was carried by United Kingdom airlines in July 1951 than in any previous month. A total of over 15,000,000 short load ton-miles was flown, as compared with 14,000,000 in June and 12,000,000 in July 1950. Passenger-mileage during the month reached 111,000,000—an increase of 10 per cent over the figure for the previous month—while the overall revenue load-factor rose to 68 per cent. A particularly large increase was seen in B.O.A.C.'s passenger services, which achieved a load-factor of 74 per cent on the Eastern routes. B.E.A. also did well, recording a 74 per cent load-factor for the month on all services, and one of 79 per cent on British internal routes.

* * *

The first flight on the K.L.M. Amsterdam-Tokyo service will be made on December 4th. The company's new Amsterdam-Sydney service will be opened on December 7th.

* * *

Dr. V. Gruberg-Gore, chief of Israeli Civil Aviation, is shortly to visit Elmdon Airport, Birmingham. Besides studying operation methods there, he is seeking to recruit ground staff and pilots for Israel's two nationalized airlines. Large-scale expansion plans are almost complete, and Dr. Gruberg-Gore hopes to negotiate the purchase of new equipment; Israeli aircraft have to carry a heavy proportion of freight.

* * *

M.C.A. Information Circular No. 131/1951 is a reminder that air travellers embarking for overseas destinations must, at their port of embarkation, be in possession of ration books and National Identity Cards, which may be required for inspection. If a traveller intends to reside outside the U.K. for more than three months he should also bring his National Health Medical Card which has to be surrendered. Air transport operators and touring pilots are requested to familiarize themselves with these requirements.

* * *

Alaska Airlines have applied to the C.A.B. for permission to operate regular services with jet aircraft from Fairbanks, Alaska, across the North Pole to Europe. The ultimate destination would be Paris, with an intermediate stop at Oslo and London. Although the application has already been filed, it represents a long-range plan which would probably not be put into effect before 1956. Jet transports are expected to fly the 3,200-mile Polar crossing to Oslo in five or six hours, but heavy payloads would be required to make such flights profitable.

* * *

Three new orders for Douglas DC-6Bs, totalling eight machines, have been announced. Two will be for Continental airlines, three for Compania Mexicana de Aviacion and three for Swissair. The last-named will then have six DC-6Bs, two of which have already been delivered; the remaining four will be delivered by February 1954. Swissair's machines, incidentally, will operate at 106,000 lb a.u.w. and will carry enough fuel for non-stop transatlantic flights. Total sales of DC-6Bs to date amount to 137.

CIVIL AVIATION . . .

CLUB AND GLIDING NEWS

IN August and September the Royal Aero Club entertained, at its Piccadilly H.Q., an unusually large number of visitors from overseas. Among them were the following well-known personalities: Mr. J. A. Wilson, late Director of Civil Aviation in Canada; Count von Rosen, C.-in-C. of the Ethiopian Air Force; Dr. F. H. Copes van Hasselt, I.C.A.O. representative for the Netherlands; Commodore J. F. Fabri, I.C.A.O. representative for Argentina; Capt. Joaquim de Brito Subtil, I.C.A.O. representative for Portugal; Mr. Frank N. Piasecki, president of the Piasecki Helicopter Corporation; and Mr. T. W. White, now in England as High Commissioner for Australia.

During the period of the Anglo-American Conference at Brighton and the I.C.A.O. Annual General Meeting in London, many delegates also took advantage of the temporary honorary membership invitations which were sent to them at the request of the Royal Aeronautical Society and B.O.A.C. The Club also recently had the pleasure of entertaining Brig. Gen. A. Boyd, of the U.S. Air Force who, in 1947, broke the world's speed record by achieving 1,003.7 km/hr in a Lockheed Shooting Star. Another U.S. visitor was Maj. C. E. Yeager, also of the U.S.A.F., the pilot of the first aircraft—a Douglas Skyrocket—to exceed the speed of sound.

Some of the club's old friends from overseas who have put in an appearance recently have included Dr. Edward Warner, president of the I.C.A.O. Council; Baron de la Grange, president of the F.A.I.; Mr. H. R. Gillman, director-general of the F.A.I.; Maj. Jacques Allez, president of the Aéro-Club de France; and Mr. F. Sigrist, formerly of the Hawker Siddeley Group.

The fact that the club's hospitality is highly appreciated by overseas visitors is shown by the numerous letters they have received expressing gratitude and also by the gift of a handsome 400-day clock by an American visitor, Mr. H. C. Landsiedel.

SOUTH AFRICAN CEREMONY: Mr. Stanley Walker, secretary of the Grand Central Flying Club, Johannesburg, at the inauguration of this enterprising organization, whose initiative in making its own airfield is described in the second item on this page.

HEARTENING evidence of the fact that, when money is short, personal keenness and enterprise can often surmount many of the difficulties facing private-flying enthusiasts is contained in a news item from South Africa, where members of the Grand Central Flying Club recently celebrated the opening of an airfield and club-house which they have literally constructed with their own hands. Six months previously the club members had received notice to quit the airfield they were using. Their secretary, an ex-S.A.A.F. captain, enlisted the aid of club members to clear two landing strips over 7,000ft in length on a farm belonging to a local flying enthusiast. For months these keen types and their families spent their week-ends clearing trees, levelling and ploughing; they even built the club-house, complete with kitchen.

Recently, the club was officially opened by Brig. Gen. Ross, the Civil Aviation Commissioner, who, in his opening address, thanked the builders warmly on behalf of the South African Government. This was the sort of effort, he said, which stimulated public interest in the movement.

Flying is now in full swing and the club is hoping shortly to be able to take advantage of a projected State-assistance programme designed for clubs which have to exist under difficult circumstances.

THE British Gliding Association reminds club members of the Kemsley Winter Cross-country competition for which Viscount Kemsley has donated 100 gns; cash prizes will be awarded for winning flights in both "aero-tow" and "other methods of launch" categories made between November 1st and February 29th, 1952. The competition is open to pilots holding "C" certificates or higher, and is limited to flights within the British Isles. Qualifying flights may be made in club or privately owned aircraft. Minimum qualifying distance in both classes is 15 miles and a number of other regulations also apply. There is no need, however, for pilots to give prior notice of their intention to compete; qualifying flights must be reported to the Secretary of the B.G.A. within 48 hr of completion.

OF interest to the more experienced private pilots will be the news (contained in *M.C.A. Information Circular No.* 31/1951) that in connection with the initial issue of an Instrument Rating it has been decided that for holders of Private Pilots' Licences only, "descent through cloud" and "runway approach" procedures may be regarded as alternatives. The new test will, therefore, consist of general instrument flying manœuvres; radio range and instrument approach procedures; and an instrument overshoot. Normal fees for the flying test are £10 for the initial issue and £5 for renewal; these are reduced by 50 per cent if the applicant's own aircraft is used.

WHITE WALTHAM WINE-TASTING

"DO not tilt from the horizontal position more than is necessary, and then only gently." So says a little book on the handling of vintage wines, and likewise warns us to "beware of over-icing" and to "warm-up very slowly." Certain vintages it describes as "of a robust character and of fine quality."

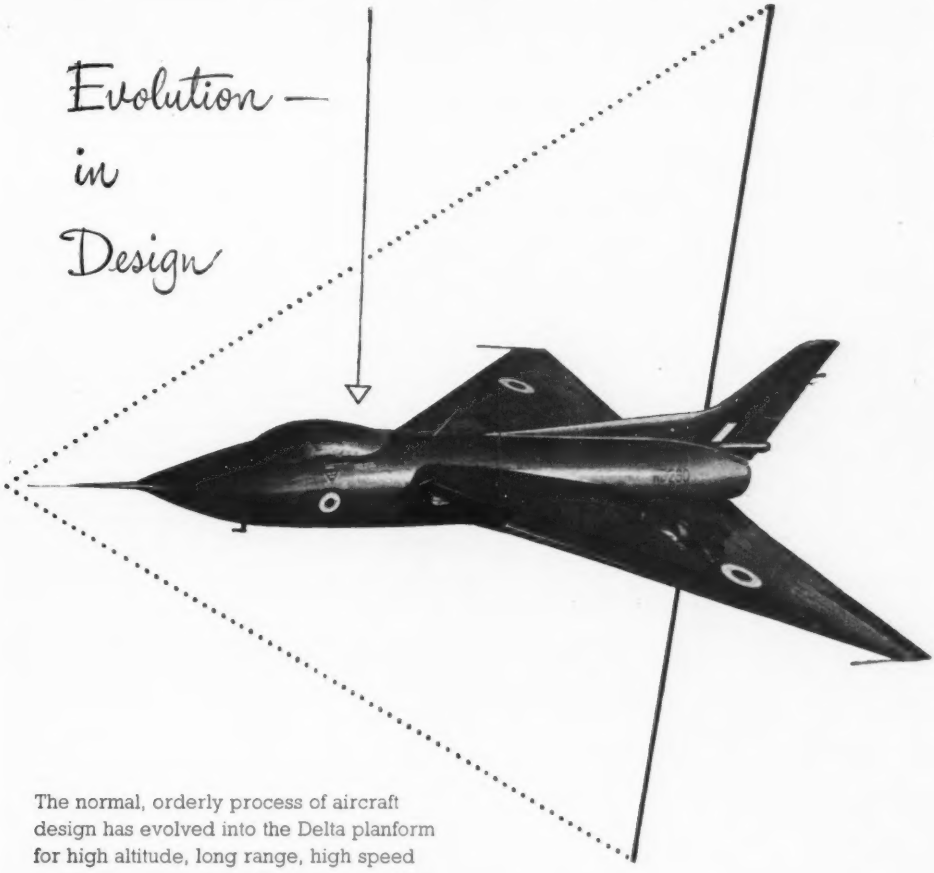
All of which unquestionably goes to show how apt is the title of "The Vintage Aeroplane Club," to form which a score of enthusiasts decanted themselves from an assortment of Old and Crusted aircraft and cars at White Waltham last Saturday.

Actually, arrivals of true vintage types were disappointing, in spite of a sunny, clear afternoon; but there were just enough Hornet and Puss Moths, aided by G-AEUW, Mr. P. J. Colbourn's Aeronca 100 from Farnborough, and G-ABEE, Capt. R. E. Gillman's Avian (which has been raced consistently during the past season) to give the tarmac a nostalgic pre-war appearance. The Aeronca, incidentally, won the sealed-time arrival competition.

Future possibilities were discussed at an informal fireside meeting in the West London Aero Club's lounge. Pending confirmation at the first committee meeting, the subscription was fixed at a modest guinea (associates, 10s. 6d.), Capt. Gillman—who first mooted the idea in a letter in our correspondence columns a month ago—was elected chairman, Mr. H. E. Scrope (owner of Mew Gull G-AEXF) treasurer and Mr. David F. Ogilvy (not "Ian H" as incorrectly quoted last week) secretary. A week-end rally was fixed for January 19th-20th, by which time it is hoped everything will be on a firm basis and a definite decision reached about a home airfield. To keep interest alive, an evening social gathering is to be held at Denham on December 1st.

Meanwhile, what the V.A.C. particularly wants, apart from members, is information—information about the whereabouts and ownership of vintage aircraft, which are notoriously difficult to trace once their Cs of A have expired; so if any reader knows of anything tucked away in a woodshed, Mr. Ogilvy (9, Imperial Road, Windsor, Berks) will rejoice to hear of it.

Evolution — in Design



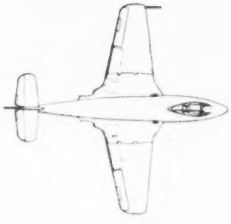
The normal, orderly process of aircraft design has evolved into the Delta planform for high altitude, long range, high speed and heavy payload. And Avro's successful 707A and B demonstrate one further important point—the Delta handles like any conventional aircraft.

AVRO DELTA

A. V. ROE & CO. LTD. MANCHESTER / MEMBER OF THE HAWKER SIDDELEY GROUP

PIONEER . . . AND WORLD LEADER IN AVIATION

The Sea Hawks report for duty...



The first squadron of Sea Hawks is now going into carrier service with the Royal Navy. Back of these new Hawker jet aircraft is a great naval fighter tradition which proudly bears the illustrious names of The Hedgehog (1924), The Horsley (1926), The Osprey (1930), The Nimrod (1931), The Hart, The Hurricane and the Sea Fury. Like the Royal Navy, Hawkers have a tradition second to none. In aircraft and seapower— there's definitely something to tradition.

HAWKER AIRCRAFT LIMITED

KINGSTON-ON-THAMES, SURREY / MEMBER OF THE HAWKER SIDDELEY GROUP

PIONEER... AND WORLD LEADER IN AVIATION

SERVICE AVIATION

Royal Air Force and Naval Aviation News

HUNDRED AND ONE IS FIRST: Ground crews of No. 101 (Bomber) Squadron servicing one of their English Electric Canberras, with which the unit is the first to be equipped. The notes and photographs on this page are reproduced by courtesy of the "R.A.F. Review."

No. 101 Squadron Gets Canberras

THERE must be some magic in the figure 101—or perhaps it is something to do with the quality of the unit. Even as long ago as 1929 No. 101 Squadron was favoured by having high-performance Boulton and Paul Sidestrands, while other bomber squadrons had to manage with trusty but obsolescent Virginias. No. 101 now has Canberras and is the first bomber unit to be so equipped.

S/L. E. Cassidy, D.F.C., the commanding officer, spent some time at the English Electric's company's works at Warton, near Preston, and flew with W/C. Beamont to get the feel of the new aircraft. The other pilots of the squadron have been converted to jet flying on Meteor 7s; in most cases they went solo after about three hours, and are now flying the Canberras after 20 hours' solo on the Meteors.

When the cantilever monoplane bomber was introduced into the R.A.F. it represented, up to that time, the greatest increase in performance the Service had ever experienced. The new change from four-engined piston aircraft to twin jets, is an even more radical one, for the 290 m.p.h. maximum speed of the Lincoln has been more than doubled and the operational ceiling of 22,000 ft raised to well over 40,000 ft.

Regretfully, No. 101 has had to say goodbye to all its signallers, flight engineers and air gunners. A Canberra carries a crew of only three—a pilot, a navigator/plotter and an observer. The functions of the two latter are to some extent interchangeable but in the ordinary way it is the navigator/plotter who, with radar aids, vectors the Canberra on to its target, while the observer moves forward from his position—next to the navigator and behind the pilot—to the bomb sight in the nose. It has been stated that by employing radar aids the Canberra can bomb accurately through eight/eights cloud from over 40,000ft.

Obviously, the cabin has to be pressurized for operation at these great heights and some provision has had to be made to prevent sudden loss of pressure from any cause, enemy or otherwise, from seriously affecting the crew. Pressurized waistcoats are worn but normally kept deflated. If the pressurization fails, then the oxygen supply can be diverted into the waistcoat, when the wearer's own inhalations and exhalations then provide the necessary pressure to force a supply of oxygen into the lungs. The change from normal oxygen intake to pressurized intake is effected by the operation of a simple switch. All the crews, of course, have to undergo ground test in decompression chambers to make sure that they can withstand the effects of extremely high flying.

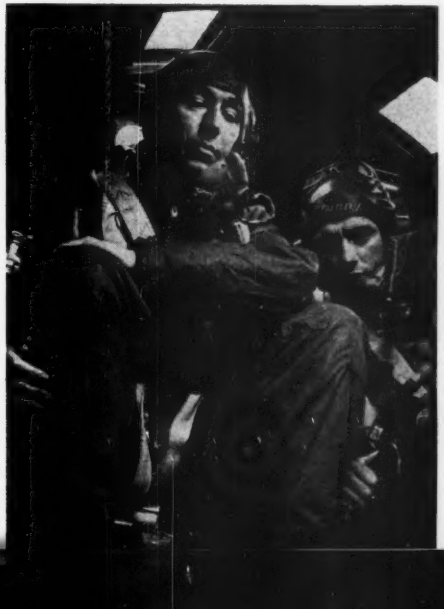
It might be thought that the super-performance of the Canberra would entail excessively high take-off speeds. This is far from being so: it is airborne at 95 knots; undercarriage limitation is 150 kts and cruising speed 450 kts.

Charity Ball

IT is hoped that the Royal Air Force Escaping Society's funds will benefit considerably from the proceeds of the charity ball to be given by the Aberdeen University Air Squadron on Wednesday, November 28th.

Lord and Lady Tweedsmuir will be amongst a number of eminent people who

JET BOMBER AIRCREWS: (Below) Master Navigator E. T. Durtnall and F/Sgt. C. L. Warren in their ejection seats, which are situated behind the pilot. (Right) S/L Cassidy (in battledress) with some of the aircrews of No. 101 Squadron.



SERVICE AVIATION . . .

have already promised to attend and a local "escaper," J. S. J. Stephen, hopes to entertain his helper from the Continent.

Funds of the R.A.F. Escaping Society are used to help the people and their families who aided R.A.F. prisoners to escape. Particulars may be obtained from S/L. I. L. McG. Hallam, Aberdeen University Air Squadron, Powis Gardens, Aberdeen.

Naval Aviation Appointments

THE Admiralty announce the appointment of Capt. E. V. St. J. Morgan, D.S.C., to command H.M.S. *Warrior*. The aircraft carrier is at present on a trooping voyage to the Far East, carrying also replacement aircraft. Among the personnel are four officers and 385 ratings, who will relieve the major part of the company of the aircraft maintenance carrier, H.M.S. *Unicorn* (Capt. J. Y. Thompson).

Another carrier appointment is that of Capt. W. G. Brittain, C.B.E., to H.M.S. *Indomitable* as Captain of the Fleet to the C-in-C. Home Fleet.

Air Lift Complete

TRANSPORT COMMAND completed the air transportation to Libya of the 19th Infantry Brigade Group on Friday last. The operation necessitated 81 sorties by Hastings, which left at intervals of two hours for the seven-hour journey. It is computed that 249,000 air miles were flown during the trooping operation.

The "slip crew" system, developed by Transport Command on the Britain-Singapore route, was employed. This enabled the aircraft to be turned round in 2½ hours and the aircrews to get 18½ hours' rest between flights.

Meanwhile the reinforcing of the Canal Zone goes on by air and sea. The two carriers *Illustrious* and *Triumph* are now converted for trooping, and the whole of the 1st Infantry Division has been taken by air to Egypt.

New C.O. for No. 91 Wing

COMMAND of No. 91 Wing, R.A.A.F., in Japan has been taken over by G/C. A. G. Carr, A.F.C., from G/C. A. D. Charlton, O.B.E., who has returned to Australia to take up the post of Air Commodore Operations.

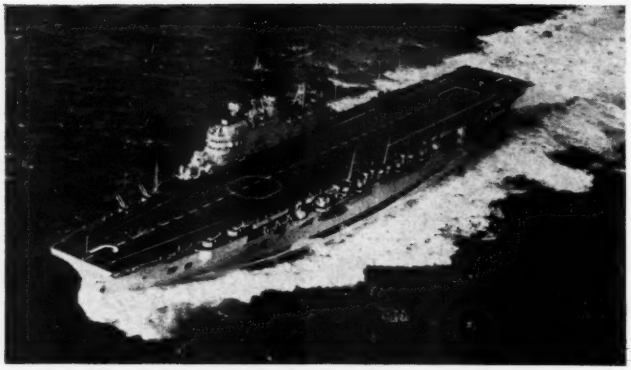
R.N.V.R. Re-equipment

THE provision of more modern aircraft for R.N.V.R. squadrons is proceeding smoothly. Two squadrons will take delivery of new machines during the next four weeks. No. 1832 at Culham, Berkshire, are to have their Seafire 17s replaced by Mark 11 Sea Furies, and No. 1830, the only Scottish unit, will change their Mark 1 Fireflies for the Mark 6 variety.

The only squadron then remaining to be re-equipped will be No. 1833 at Bramcote, Warwickshire. They will change their Seafires for Sea Furies next year.

No. 77 Completes 5,000 Sorties

RECENTLY No. 77 Squadron, R.A.A.F. made its 5,000th sortie in the Korean war. In a message of congratulation, Major-Gen. F. F. Everest, of the United States Fifth Air Force, said : "The tradition of skill and bravery established by R.A.A.F. in World War II is being carried forward by No. 77 Squadron in Korea. The squadron went into action with their Mustang aircraft at the very outset of the war. It made a major contribution to the retention of the perimeter and to the most successful military operation which followed. Now equipped with Meteor jets, No. 77 Squadron is stronger than ever. My congratulations to the officers and men of this gallant unit on their completion of 5,000 effective combat sorties."



UNDER THE WHITE ENSIGN : Britain's newest and largest aircraft carrier, H.M.S. "Eagle," wearing the White Ensign for the first time as she completes her steaming trials in Bangor Bay. Built by Harland and Wolff at Belfast, the ship is said to have cost more than £14 million.

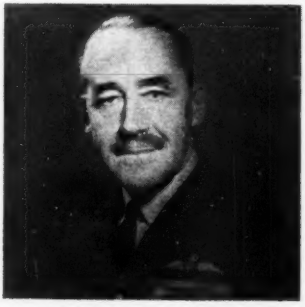
R.C.A.F. Appointments

THREE senior R.C.A.F. appointments have been announced. A. Cdre. W. E. Bennett is to be Air Attaché at the Canadian Joint Staff in Washington D.C., enabling A. Cdre. H. M. Hendrick, whom he replaces, to attend the Imperial Defence College in Britain. A. Cdre. J. G. Kerr, now at the Imperial Defence College, will, on his return, command the Tactical Air Group.

L. G. Groves Memorial Awards

THE winners of the L. G. Groves Memorial prizes and award for 1951 have been announced. The prize for aircraft safety goes to W/C. S. H. Jordan, O.B.E., "for the development of special de-misting and de-icing equipment." Dr. R. C. Sutcliffe, O.B.E., B.Sc., has won the prize for meteorology with his "contribution to the science of forecasting and his influence on meteorological research." The award for meteorological air observers has been won by F/L. D. Carlson "for the enthusiasm he has shown during the past three years on meteorological air reconnaissance duties."

Major Groves will make the presentations in the Air Council room at the Air Ministry on November 14th. A.V-M. T. N. McEvoy, Assistant Chief of Air Staff (Training), will preside.



Air Marshal Hardman, C.B., C.B.E., D.F.C., who has been placed at the disposal of the Australian Government to take up the appointment of Chief of Air Staff, R.A.A.F., in succession to Air Marshal G. Jones.

No. 410 for Britain

ALL personnel and the F-86s of No. 410 Squadron, R.C.A.F., left Canada on November 3rd in H.M.C.S. *Magnificent* for Britain. The carrier is due to arrive at Glasgow on November 13th, where she will spend three days unloading the Sabres and loading some new Sea Furies for the Royal Canadian Navy.

R.C.A.F. Para-rescue Team

MARKING the end of 14 weeks' arduous training, two medical officers, four nursing sisters and nine medical assistants of the Royal Canadian Air Force have received their Para-rescue badges from Air Marshal W. A. Curtis, C.B., C.B.E., D.S.C., E.D., Chief of the R.C.A.F. Air Staff. Five nurses started the course, but F/O. Muriel Beaton broke a leg during a practice jump. F/O. R. Clark, because of his experience in training women parachutists, was lent by the R.A.F. for this course.

Each trainee had to make a total of ten jumps—six into open country and a further four into densely timbered areas. Physical training took up a large proportion of the curriculum, but the main subject, other than actual parachuting, was bush lore. In this last subject members of the team were taught how to maintain life and find their way about in the wilds.

The members taking the course were : *Doctors*—S/L. D. O. Coons and F/L. J. R. Wynne. *Nursing Sisters*—F/O. A. Peden, F/O. M. F. Neily, F/O. J. I. Thomson and P/O. M. L. MacDonald. *Medical Assistants*—Sgt. G. H. Westwood, Cpl. L. P. Foster, Cpl. J. N. F. Deschenes, Cpl. H. W. B. Campbell, Cpl. J. H. Ferguson, L.A/C. J. P. Strachan, L.A/C. K. B. White, L.A/C. J. E. G. Pare and L.A/C. C. P. Cooney.

R.A.F. Benevolent Fund Change

FOR personal reasons, Air Marshal Sir Philip Babington has resigned from the council, the finance and general purposes committee and the grants committee of the R.A.F. Benevolent Fund. In all these appointments he is succeeded by Air Chief Marshal Sir James Robb, who has lately retired from the R.A.F.

LOW-ASPECT-RATIO AERODYNAMICS

A Review of Lifting-surface Theories with Reference to Non-linear Effects

PRESENTED at the recent R.Ae.S.—I.Ae.S. conference a paper by Mr. A. H. Flax and Mr. H. R. Lawrence, respectively head and assistant head of the Aerodynamic Research Department, Cornell Aeronautical Laboratory, was entitled *The Aerodynamics of Low-aspect-ratio Wings and Wing-body Combinations*. It dealt with the marked non-linear variation that existed in the lift and pitching moment curves with angle of attack for low-aspect-ratio wings, and proposed suitable corrections to the lifting-surface theory which normally predicted a linear relationship. A digest follows.

Recent developments in aircraft and guided missiles capable of transonic and supersonic flight speeds have resulted in a trend towards configurations with low-aspect-ratio wings and tail surfaces. A number of rapid and convenient methods for estimating their aerodynamic characteristics have been developed for the supersonic regime, and it was the authors' opinion that agreement between the results of these methods and test data was generally satisfactory for the important range of Mach numbers and plan forms at low angles of attack. Whereas rapid methods existed for determining the aerodynamic characteristics of high-aspect-ratio wings, similar methods for wings of low aspect ratio were not so well established.

An examination of the experimental data for low-aspect-ratio wings had disclosed that there was a pronounced non-linear relationship between the aerodynamic coefficient and angle of attack. Since the usual lifting surface theory predicted a linear relationship, complete satisfactory correlation of the results of this theory with experimental data was evidently not attainable. In addition to this shortcoming, the approximations made in deducing the Prandtl and Weissinger theories from lifting-surface theory could hardly be expected to be valid for wings of low aspect ratio.

Effect of Edge-shape

Careful examination of the available experimental data on low-aspect-ratio wings had shown that the aerodynamic characteristics were strongly affected by the shape of the wing leading, trailing and side edges. Since none of the non-linear theories proposed by Bollay, Weinig, Kriesis and Scholz distinguished between various types of edges, they were applicable only to a limited class of aerofoil. Further, they did not offer a means of predicting moment or pressure distribution characteristics.

The authors suggested, however, that correlation with experimental data indicated that the predictions of linear lifting-surface theory did provide adequate approximations for the aerodynamic characteristics of low-aspect-ratio wings at low incidence. The object of the paper was to correct, with due attention to the shape of edges, the results of linear lifting-surface theory. The problem was divided into two parts; firstly the development of a rapid and reasonably accurate approximation to the lifting-surface theory for low-aspect-ratio wings and, secondly, the determination of satisfactory methods for calculating the non-linear effects. The second of these problems was attacked largely from a semi-empirical standpoint.

The lifting-surface approximations considered were limited to cases for which the computation times were of the same order as those for the Pradtl and Weissinger theories. Further, since the Weissinger theory gave satisfactory results for all the aerodynamic coefficients for aspect ratios at least as low as three, attention had been focused on approximate theories suitable for aspect ratios below three. Only wings operating below the critical Mach number for shock formation were considered.

A comparison of the theories of Prandtl, Weissinger, Wieghardt, Jones, Heaslet and Lomax, Lawrence, and Lomax and Sluder had shown that the Weissinger theory gave the correct lift for all aspect ratios, but failed to predict moment and pressure distributions for a large class of low-aspect-ratio plan forms; for example, rectangular wings. For wings with convex trailing edges, the Jones result was in good agreement with lifting-surface theory for aspect ratios below a half, even for rectangular plan forms. The Wieghardt theory of the rectangular wing was satisfactory for all aspect ratios below three. The Lawrence theory provided adequate approximations to lifting-surface predictions for all plan forms with straight trailing edges and aspect ratios below three. Lomax and Sluder had developed a theory for delta wings which did not appear to be in as good agreement with experimental results as that given by Lawrence or even Jones, for very low aspect-ratios.

The second problem in the calculation of aerodynamic coefficients of low-aspect-ratio wings, that of accounting for the non-linear effects, was by no means in as satisfactory a state as the first part. Because of their magnitude, the non-linear effects were of considerable importance, nevertheless, there did not appear to be any theory which could account quantitatively for all non-linear effects. The cross-flow drag theory put forward in various forms by Betz and Kriesis for low-aspect-ratio wings, and by Allen and Van Dyke for slender bodies, seemed to offer the best basis of correlation of experimental data and construction of semi-empirical methods.

As low-aspect-ratio wings were almost invariably used in conjunction with bodies whose diameters were large compared with the wing span, any treatment which did not include wing-body interaction effects was of limited value. The lifting-surface theory for low and high-aspect-ratios was then reviewed and comparisons made with wind tunnel results.

Non-linear Effects

Dealing with non-linear effects, the authors were of the opinion that the non-linear character of the lift and moment curves for low-aspect-ratio wings was of considerable importance, since the additional lift which arose from the non-linearity of the curve might be of the same order of magnitude as the lift predicted by the linear lifting-surface theory. (The authors here went on to review previous theories and empirical methods, after which their own theory was presented. This theory was based on a consideration of viscous cross-flow effects by a method similar to those of Betz, Kriesis, Allen and Van Dyke.)

The proper choice of a Reynolds number for the cross-flow was not a simple matter. In the proposed theory, it was of importance mainly for wings with rounded edges, since plates with sharp edges showed no great variation in drag with Reynolds number over the practical range. If the Reynolds number of the longitudinal flow were high enough for transition from laminar to turbulent flow to take place, it could hardly be expected that the cross-flow boundary layer would still be laminar, even if the calculated cross-flow Reynolds number corresponded to laminar flow about an infinite cylinder of the same cross-sectional shape. Therefore, turbulent flow was generally assumed in the proposed theory. This stipulation was somewhat academic in most cases, because sufficient data on the drag co-efficients of the cross-sectional shapes encountered on low-aspect-ratio wings were not available and, except for relatively flat wings with non-rounded edges, the cross-flow drag coefficients would have to be found from the wing tests themselves.

Test Data Essential

Even if complete data on the drag of the cross-sectional shapes encountered were available, recourse to test data on wings would be essential. The assumptions made in the development of the viscous cross-flow concept were such that the concept might be expected to apply to long slender bodies having very slowly varying cross-section. On the other hand, its application to wings of aspect ratios of the order of one and two, as contemplated in the paper, normally would, and should, be viewed with suspicion unless heavily supported be experimental evidence. Certainly the flow in transverse planes could not possibly behave two-dimensionally if the cross-section were rapidly changing, as in a wide delta wing. Nor could this be the case near the leading and trailing edges, since they influenced a not inconsiderable fraction of the wing, even at an aspect ratio of unity.

All of these factors, and others, seemed to make it almost hopeless to attempt to compute the non-linear effects for wings of an aspect-ratio of about one, on the basis of the cross-flow drag assumption alone. In spite of this, however, surprising agreement between theory and experiment was obtained both for the non-linear lift and the moment, and this with the introduction of a minimum of empirical constants.

A comparison of the formulae given by various investigators then followed, and it was noted that all sets of delta wings showed a change in the character of the experimental lift curve for some aspect ratio between two and three. Below an aspect ratio of two, the curves had the upward trend characteristic of low-aspect-ratio wings, while at aspect ratios above this order they become rather straight and even curved in the other direction. It was clear that there was some dividing line in the region of aspect-ratios between two and three. The extent to which this depended on Reynolds number, profile, roughness and edge-curvature was almost uninvestigated, and it was the authors' view that this remained an important subject for future research.

THE INDUSTRY

TWO BELFAST APPOINTMENTS

TWO recent managerial appointments in the organisation of Short Brothers and Harland, Ltd., are announced by the company.

The appointment of Mr. G. T. Gedge as works manager was recently approved, and in this capacity Mr. Gedge is now responsible for the management of the Queen's Island factory (including the supplies department and the production engineering department), the Altona factory at Lisburn, and all work relating to these two plants in the Hawlmark factory at Newtownards.

George T. Gedge's entire working life has been devoted to the firm, which he joined in 1926 as an apprentice, serving his time at Rochester under such men as Mr. Oswald and Mr. Eustace Short, Sir Arthur Gouge, Mr. A. E. Bibby and Mr. C. P. T. Lipscomb. In 1932 he had risen to the position of chargehand; in 1938 he became a senior planner and rate-fixer; and three years later he was appointed superintendent of the factory established in Cambridge for the production and repair of Stirlings.

When he returned to Rochester in 1946 as personal assistant to the managing director there fell on his shoulders the burden of planning and supervising the transfer from Rochester to Belfast of

Mr. G. T. Gedge

Mr. W. D. Thomas

200 key personnel and thousands of tons of plant and equipment—all with the minimum interruption of production. This task took two years to complete and late in 1948 Mr. Gedge also arrived in Belfast, where he took up the appointment of production manager, the post he occupied until his latest appointment. The little spare time which his duties now allow him is taken up by his great interest in motor cycle racing and trials.

The other Belfast appointment is that of Mr. W. D. Thomas, B.A. (Oxon), Ed.Dip., M.I.P.M., A.I.I.A., as personnel relations officer. A native of Holyhead, Mr. Thomas is an Honours Graduate of Oxford, and he comes to Belfast with a long experience of personnel management. He has made an intensive study of this subject, and was formerly a member of the Ministry of Labour Industrial Relations Branch, where he acted as personnel management advisor for Wales. At one time he fulfilled similar duties with the Williams Hudson Group engaged in civil engineering, shipping and lighterage.

On the vital topic of liaison between management and labour, Mr. Thomas has summed-up the current position in industry in the following terms: "It is debatable whether we normally tackle our problems of communication the right way round. It seems to me that, rather than concentrate on material ends, leaving the conditions of communication to take care of themselves, the need is first to establish the conditions for communication; for only by so doing will it be possible to make an organisation's needs and aims easily understood."

An enthusiastic Rugby player and supporter, Mr. Thomas also includes squash, fives and golf among his sporting interests.

THE SCIENCE OF PLASTICS

"*Plastics Progress.*" *Published for "British Plastics" by Iliffe and Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Price 50s (postage 1s 3d).*

BASED on lectures given at this year's Plastics Convention—which, in conjunction with the British Plastics Exhibition, aroused very considerable interest in the plastics industry and among users of its products—this important new book will form a valuable work of reference for all concerned with the subject.

The almost unlimited nature of the field today is demonstrated

TALKING IT OVER: Mr. R. E. Swift, Director of Aeronautical Inspection, with Sir Alan Cobham, K.B.E., A.F.C., chairman and managing director of Flight Refuelling, Ltd., at a recent dinner and dance organized by the S.W. Area, A.I.D. for guests of the Airspeed Division of the de Havilland Aircraft Co. at Christchurch. Mr. Swift succeeded Mr. T. Rowntree, C.B.E., F.R.Ae.S., who retired in 1950 after A.I.D. service since 1915.

in a contribution, *The Place of Plastics in Industry*, by Sir Ben Lockspeiser, F.R.S. Advances in plastics technology are described in papers devoted to such aspects as progress in plastics materials; vinyl formulation and compounding; true synthetic fibres; developments in synthetic resins; techniques of fabrication; film production and handling; and developments in processing plant.

Containing approximately a quarter of a million words, and 60 tables, the book is illustrated by over 400 photographs and diagrams.

HEALTH OF WELDERS

RESULTS of an investigation into the possibility of harmful effects to workers engaged on welding operations have been published by the Factory Department of the Ministry of Labour and National Service (*The Health of Welders*, by A. T. Doig, M.D., D.P.H., and L. N. Duguid, B.Sc., A.M.I.Mech.E., M.I.W.; H.M. Stationery Office, price 3s).

The main conclusion is that, apart from temporary effects on the vision, welders have no need to fear "occupational disease." In some circumstances, bronchial irritation from fumes may be experienced, and recommendations are made as to the ventilation of welding shops.

IN BRIEF

THE full range of Schermuly aeronautical pyrotechnics, from 6 oz dinghy distress signals to 10½ lb rocket parachute flares, and including Verey pistols and rocket life-saving equipment, is described in a new catalogue from The Schermuly Pistol Rocket Apparatus, Ltd., Newdigate, Surrey.

* * *

Accles and Pollock, Ltd., and Metal Sections, Ltd., the Tube Investments subsidiaries, have opened a new joint Scottish office at the Engineering Centre, 351, Sauchiehall Street, Glasgow, C.2 (Douglas 6306). Mr. R. H. R. Court is in charge.

* * *

The many aspects of commercial aerial photography which they undertake are dealt with in a new brochure issued by Aerofilms, Ltd., 6 Elstree Way, Boreham Wood, Herts.

* * *

Under the title of Die Designs, a new company has been formed by a group of tool-designers with considerable experience of aircraft press-tool, jig and fixturer equirements. Their drawing-offices are at 15, Third Avenue, London, W.3 (Shepherds Bush 6800).

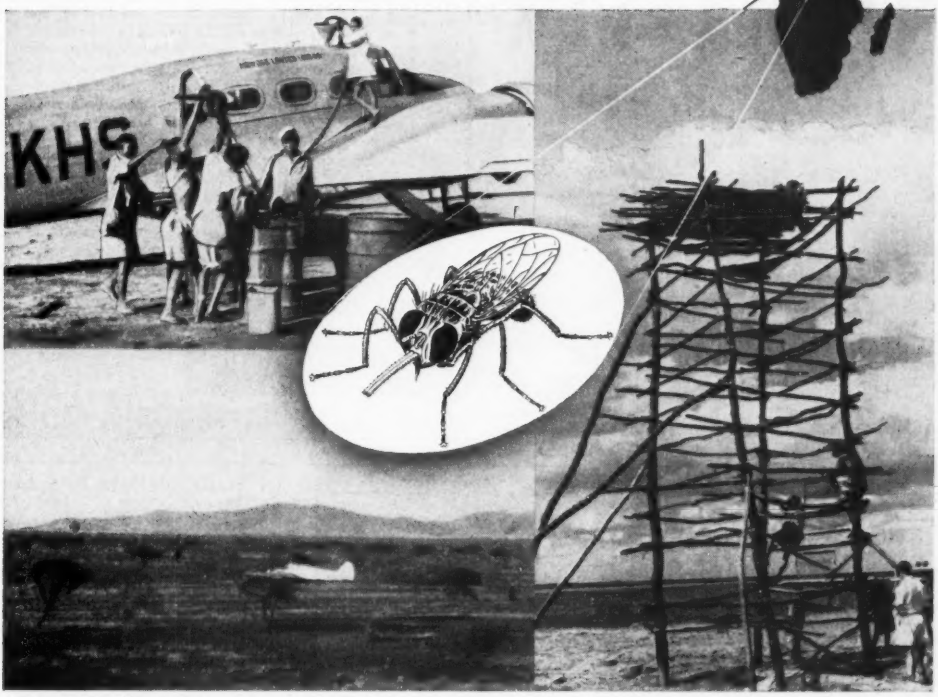
* * *

Included in a considerably revised and enlarged revision (B.S. 949 1951) of *British Standard for Screwing Taps*, are a number of extra tables of general dimensions and tables of limits of size and tolerances of taps for the recognized British Standard thread series, including Unified screw threads. The new schedule is obtainable at 15s, post free, from the British Standards Institution, 24 Victoria Street, London, S.W.1.

* * *

A brochure issued by the Northern Aluminium Co., Ltd., Banbury, entitled *Northern Aluminium Company's Foundry and Forge*, describes, with copious illustrations, the way in which Noral castings and forgings are fabricated at the firm's original Handsworth (Birmingham) Works. Also included are notes on design and properties, illustrated by examples of some of the more interesting components produced.

AIRWORK IN EAST AFRICA



(Above—top) Insecticide is pumped into the spray tanks in the aircraft.
(Above) The aircraft checking on drift whilst flying at operational height.

An observation tower built at one of the ground control points. The aircraft flies over this as it establishes radio contact with the ground party.

AIRWORK LIMITED

The work of controlling the tsetse fly undertaken by Airwork Limited in East Africa is a necessary preliminary to great agricultural expansion in the territory. Specially modified Anson aircraft are used to spray the tsetse-infected bush over large areas.

THE SERVICES OF AIRWORK

● Air Transport Contracting ● Sale and Purchase of Aircraft ● Servicing and Maintenance of Aircraft ● Overhaul and Modification of Aircraft ● Operation and Management of Flying Schools and Clubs ● Radio Sales and Service ● Insurance

AIRWORK LIMITED · 15 CHESTERFIELD STREET · LONDON · W.1 · TEL: GROSVENOR 4841

Also at: Blackbushe Airport, Nr. Camberley, Surrey. Booker Aerodrome, Marlow, Bucks. Gatwick Airport, Horley, Surrey. Langley Aerodrome, Bucks. Loughboro' Aerodrome, Dishley, Leics. Perth Aerodrome, Perthshire. R.A.F. Station, Digby, Lincs. Royal Naval Air Station, Brawdy, Nr. Haverfordwest, Wales. Usworth Aerodrome, Castletown, Co. Durham

OIL
PETROL &
WATER
RESISTING

NEO-K-TEX

Jointing Material

GASKETS
WASHERS
SHEETS &
MOULDINGS

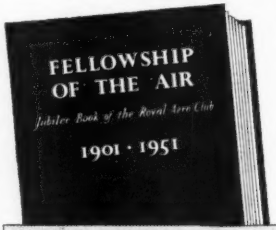
KAUTEX LTD
ELSTREE WAY, ELSTREE, HERTS.
TELEPHONE: ELSTREE 1777-8-9

FELLOWSHIP OF THE AIR

Jubilee Book of the Royal Aero Club

This book, by B. J. Hurren, is the story of the Royal Aero Club of the United Kingdom. Opening with the remarkable circumstances surrounding the founding of the Club in 1901, it goes on to describe the ballooning era, the coming of the aeroplane, and pioneer flights; then on to the expansion of air transport in World War I, the inter-war years of private and sporting flying, the demands made upon private flyers in World War II, and finally the resurgence of the private flying movement in the post-war years.

The book is a tribute to the vision, courage and determination of the men and women whose work has kept Britain foremost in the air.



30s. net.
By post 30s. 9d.

Obtainable from all booksellers or from:-
ILIFFE & SONS LTD., DORSET HOUSE, STAMFORD ST., LONDON.

THE
DE HAVILLAND
ENGINE COMPANY LIMITED
have vacancies in their
DESIGN OFFICE at STAG LANE
for
SENIOR DESIGNERS & DRAUGHTSMEN
for work on Gas Turbine development and other projects
GOOD SALARIES & PROSPECTS
for suitable applicants
SUPERANNUATION SCHEME
Apply giving details of previous experience and salary
to
THE PERSONNEL OFFICER
STAG LANE, EDGWARE
MIDDLESEX

APPLICATIONS are invited for following permanent and progressive posts with prominent aircraft company in Greater London area commencing new and interesting project of national importance.

SENIOR DESIGN DRAUGHTSMEN with university degree and/or Ordinary National Certificate or Higher National Certificate and experience in one or more of the following: Servo mechanisms, gyros, hydraulics, pneumatics, materials and structures as related to aircraft or armament work.

DRAUGHTSMEN with experience in mechanical, hydraulic or pneumatic accessories or aircraft structures. Ordinary National Certificate desirable but not essential if otherwise suitably experienced.

STRESSMAN of degree standard with experience in stressing of aircraft structures and with knowledge of materials. Permanent senior position with good salary and pension plan is offered to suitable applicant.

FLIGHT ENGINEER (guided missiles). Applicant should be of degree standard and have practical experience of mechanical and electrical installations. Knowledge of telemetry and servo mechanisms is desirable though not essential.

YOUNG TECHNICIANS for development work on hydraulic, pneumatic components. Applicants should have A.M.I.Mech.E., or a degree, and have some practical experience.

Please apply in writing, giving full details, to Box A.C. 66657, Samson Clarks, 57-61, Mortimer Street, London, W.1.

WELL-KNOWN AIRCRAFT FIRM in Greater London area commencing highly important new project invites applications for the following posts:

HONOURS GRADUATES AND GRADUATES with knowledge of supersonic aerodynamics and/or servo mechanism approach to stability.

TECHNICAL ASSISTANTS wanted for work on supersonic aerodynamics. Higher National or Inter B.Sc. standard.

YOUNG MEN AND WOMEN are required as Junior Assistants. The work will involve calculations on many new and interesting projects, with excellent prospects for promotion based on merit. Applicants should have a sound general education and an aptitude for mathematics.

Please apply in writing, giving full details, to Box A.C. 66663, Samson Clarks, 57-61, Mortimer Street, London, W.1.

IN *YOUR* MOMENT
OF REMEMBRANCE

Please
Remember Generously

Poppy Day

SATURDAY, NOVEMBER 10

Issued by British Legion, Haig's Fund, Pall Mall, London, S.W.1

(Registered under the War Charities Act, 1940)

FLIGHT and AIRCRAFT ENGINEER

PRESS DAY—*Classified advertisement "copy" should reach Head Office by* FIRST POST THURSDAY *for publication in the following week's issue subject to space being available.*

CLASSIFIED ADVERTISEMENTS

Advertisement Rates. 4/- per line, minimum 8/-, average line contains 6-7 words. Special rates for Auctions, Contracts, Patents, Legal and Official Notices, Public Announcements, Tenders 5/- per line, minimum 10/-. Each paragraph is charged separately, name and address must be counted. All advertisements must be strictly prepaid and should be addressed to FLIGHT Classified Advertisement Dept., Dorset House, Stamford Street, London, S.E.1.

Postal Orders and cheques sent in payment for advertisements should be made payable to Iliffe & Sons, Ltd., and crossed & Co.

Trade Advertisers who use these columns regularly are allowed a discount of 5% for 13, 10% for 26 and 15% for 52 consecutive insertion orders. Full particulars will be sent on application.

Box Numbers. For the convenience of private advertisers Box Number facilities are available at an additional charge for 2 words plus 1/- extra to defray the cost of registration and postage, which must be added to the advertisement charge. Replies should be addressed to "Box 0000, c/o Flight," Dorset House, Stamford Street, London, S.E.1.

The Publishers retain the right to refuse or withdraw advertisements at their discretion and do not accept liability for delay in publication or for clerical or printer's errors although every care is taken to avoid mistakes.

AIRCRAFT FOR SALE

DAKOTAS. . . . Some buyers may find on telephoning we have sold the aircraft in which they were interested. But we shall be having more and invite buyers to keep us posted with their requirements. We still have two Doves at the time of sending this advertisement to the publishers.

WRITE OR TELEPHONE:
AEROSERVICES (LONDON) LTD.,
31, CLARGES STREET,
LONDON, W.1.
Tel.: Grosvenor 7378.
Cables: Aeropaul, London. [0940

VENDAIR, ROOM 200, CROYDON AIRPORT, OFFER:

AIRCRAFT: 2 Proctor IIIs and Tiger Moths.
ENGINES: Majors, Lycomings, Cheetahs, spares, etc.
PROPELLERS: Proctor, Tiger and Dakota.
SPARKING PLUGS: Cheetah, Queen II and Major.
INSTRUMENTS: Engine, flying and navigation.
ELECTRICAL: 5C, 5D, 6A, 10A, 10B, etc.
RADIO: TR.1143, B.C.375, T.R.1133.
VENDAIR, CROYDON AIRPORT, CROYDON 7744. [0603

MILES MAGISTER for sale:
Airframe hours ... 1500.00
Engine hours ... 400.00
12 months C. of A.
OFFERS.
COWES AIRPORT
COWES, ISLE OF WIGHT. TEL. 535. [7209

R.
K.
D
UNDAS, Ltd.

HAVING successfully forecast the General Election result in print before Polling Day, we now venture another pearl from our crystal. It is that the Busy Birdmen of Bury Street will sell more aeroplanes and equipment in 1952 than ever before. But then in fairness to our crystal we must confess that we know this is to be so before we start because our order book says so.
BUT please send your inquiries nevertheless. Everything has priority here and it's a good time to buy.

R.
K.
D
UNDAS, Ltd., 29, Bury St., London, S.W.1.
WHI. 2848. Cables: "Dundasaero, Piccy, London."

CROYDON AIRPORT. Cro. 0408. [0559

C
F
I
E
L
D
S

OFFER fully overhauled Pratt and Whitney series 1830-90D, 90C and 92 engines at nil hours—test time only. Fully guaranteed and released to A.R.B. requirements, engines enclosed in cocoon plastic coat for shipment overseas.
WE invite enquiries for the overhaul of all types of engines.
WHATEVER type of aircraft you require for immediate purchase, contact:—
FIELD AIRCRAFT SERVICES Ltd., Croydon Airport, Surrey. Tel.: Croydon 7777. Cable: Fieldair, Croydon. [0258

SEA OTTER amphibious aircraft for sale, new. Only test flown three hours. Owner's plans now changed, willing seller. Sacrifice price. Write: Owner, 51, Sidbury, Worcester. [7082

Finest Quality
HORSEHIDE GAUNTLETS fully white wool lined; Black or Tan, 65/-. Fully lined HORSEHIDE GAUNTLETS, 32/6. All Black Leather fully lambswool lined FLYING BOOTS, £5/19/6. All Leather fully white wool lined zip-front calf-length BOOTS, 94/6, brown only. Fully zipped FLYING SUITS, super quality WHITE DRILL, 95/-, buttoned 49/-. Brand new WHITE SILK INNER GAUNTLETS, 6/6. DALTON COMPUTORS, brand new, 50/-. Soft Cape INNER GLOVES, 12/6. Sheepskin lined FLYING JACKETS (new) £7/15/-, (slightly used) £6/15/-. Lambswool FLYING GLOVES, 45/-. Sheepskin MOTORING GLOVES, 27/9.
TERMS TO FLYING CLUBS. TRADE SUPPLIED. SEND 3d. IN STAMPS FOR ILLUSTRATED CATALOGUE.

D. LEWIS LTD. (DEPT. F)
Leather Clothing Manufacturers for Home or Export
124 GT. PORTLAND ST., LONDON, W.1
Trade Inquiries Invited.
Tel.: Museum 4314. Grams.: Aviakit, Wesdo, London

THE COMPLETE AERONAUTICAL SERVICE

EAGLE AVIATION LTD

Head Office:
29 Clarges Street, London, W.1
Phone: Grosvenor 6411
Cables: Speedlode, Audley, London
Maintenance and Operations:
Luton Airport, Luton, Bedfordshire
Telephone: Luton 5737

R.A.F. OFFICERS
UNIFORMS
NEW AND RECONDITIONED
LARGE SELECTION IN STOCK
FISHERS, 86/88 WELLINGTON ST., WOOLWICH, S.E.18 'PHONE: 1055

AIRCRAFT FOR SALE

W.
S.
S.
W. S. SHACKLETON, Limited, 175, Piccadilly, London, W.1.

EUROPE'S biggest aeroplane dealers have another anecdote to relate.

EVERY now and then something happens that "makes you think" so to speak. Last week an old and valued client called to buy an aeroplane in which to train his son. The son, in the course of conversation asked "Why father, do you always buy your aeroplanes from Shackletons?" "Your Grandfather was a very discerning old gentleman" was the reply. "What was good enough for him is good enough for me."

NOW there is more in that than meets the eye. Today they are not just "good enough," they are better—even though some of those old vintage aeroplanes are still flying. They have advanced. Our present client's father's father had scattered sand in the faces of awe-struck thousands as he rose imperturbable in his balloon from Wandsworth Gas Works. The son of his son now rises with perhaps less dignity but the same abandon in a Shackleton supplied J/4 Autocrat. It is significant that three generations should have come to our office in their day. The following Austers are some of the machines actually held in stock and their details will give an idea of the versatility of the offers:

£1195 AUSTER AIGLET with Gipsy Major engine. This is the first used Aiglet to be offered and is the identical machine in which Ranald Porteous gave the memorable display at last year's S.B.A.C. Show. It has just completed its first C. of A. by the makers and is indistinguishable from new. It is finished in silver and red and is virtually a new aeroplane. Its total flying life numbers about 80 hours.

£675 AUSTER AUTOCRAT. A really first class aeroplane recently C. of A.'d by the makers, with completely new fabric throughout. The aircraft has flown 400 hours and is immediately available, complete with directional gyro and metal propeller.

£425 AUSTER V, fitted with Cirrus Minor II. The best offer over £425 secures an extremely sound aircraft with new C. of A. and special engine installed by the engine manufacturers. This is a thoroughly reliable first class aircraft equipped with self-starter as extra.

£685 Another AUSTER AUTOCRAT. This machine is completely ready with new C. of A. It is finished in cream and green and equipped with long-range tank, starter, and metal propeller. Ready to go and in perfect export condition.

BELOW are one or two other aircraft of interest:

£550 PROCTOR V. An excellent 4-seater aircraft with current C. of A. Repainted to customer's requirements. Any demonstration will be gladly given.

£??? A really nice PERCIVAL VEGA GULL. Only 75 engine hours since complete overhaul. Current C. of A., full dual, full blind flying panel, cockpit and landing lights, time of flight clock, long-range tanks, and powered with a Gipsy VI 2 engine and constant speed propeller. An ideal racing mount for next year's events.

£105 CESSNA C34. We have just been instructed by the owner going abroad to reduce the price. This aircraft is very well equipped and the engine alone is worth the money! It has no C. of A.

W. S. SHACKLETON, Limited, 175, Piccadilly, London, W.1. Tel.: Regent 2448/9. Overseas cables: Shackhud, London. [0070

AIRCRAFT ACCESSORIES AND ENGINES

AERO SALES, Inc., procurement specialists for all American aircraft, engines, accessories. Quotations furnished on all requests.—Address: P.O. Box 37, Miami International Airport Branch, Miami 48, Florida, U.S.A. London Agents: C. J. Fox and Sons Ltd., 117 Victoria Street, London, S.W.1. Tel.: Victoria 0204/5. [0945

AIRCRAFT ACCESSORIES AND ENGINES WANTED

CONTINENTAL A 80-9 engine, complete with life and log book; or piston and cylinder complete with rings, etc.—Harrington, 10, Orchard Close, Edgware. Tel.: Edg. 1717. [7200

AIRCRAFT SERVICING

REPAIRS and C. of A. overhaul for all types of aircraft. Brooklands Aviation, Ltd.: Civil Repair Service. Sywell Aerodrome, Northampton. Tel.: Moulton 3381. [0307

WYNSTRUMENTS LTD.
A. R. B. Approved
STAVERTON AERODROME
GLOUCESTER
Phones: Churchdown 3264 (3 lines)
Grams: "Wynn, Gloucester."

OVERHAUL, MODIFICATION TEST and CERTIFICATION *of*
AIRCRAFT INSTRUMENTS
FOR

AIRCRAFT SERVICING

F. G. MILES, Ltd., Redhill Aerodrome, Surrey. Tel.: Nutfield Ridge 2200.

AN approved design, maintenance and repair organization staffed by experts on Miles aircraft. Major and minor modifications a speciality; radio installations.

APPROVED instrument test shop; specialists in race preparations.

F. G. MILES, Ltd., Redhill Aerodrome, Surrey. Tel.: Nutfield Ridge 2200. [0391

BROOKLANDS AVIATION, Ltd., Brooklands Aerodrome, Weybridge. C. of A. overhauls, modifications and conversions. Tel.: Byfleet 436. [0305

AIRCRAFT WANTED

MAGISTER wanted.—Reply, with full details, including price, Box 4986. [0021

W. S. SHACKLETON, Ltd., Europe's biggest aeroplane dealers (20 years at this address and 119 different types of aircraft sold) have at the moment of writing over thirty aeroplanes on board ship or awaiting despatch to foreign parts. We wish to buy a few good sound Autocrats, Messengers, Consuls, and D.C.4's if we can get them!

W. S. SHACKLETON, Ltd., 175, Piccadilly, London, W.1. Tel.: Regent 2448.9. [0071

CARAVANS

A CARAVAN EXCITEMENT!

YES, of course, ex-editor caravan paper, living himself in van 13 years, with U.K.'s largest caravan business and selection (all guaranteed uniquely with free-van-for-a-leaky-one) naturally has more of the new 1952 caravan "excitements" to show you than anyone else. There's the exquisite new 22 ft. Sipson and the new Thomson and—but why not write for 1 lb. of free advice articles and brochures to the Taplow branch. Or, come and see them at London or Taplow. Good h.p. terms and part exchanges.—A. S. Jenkinson, Ltd., Bath Road, Taplow, Bucks. Tel.: Maidenhead 3434-5-6. Always open. Easy to reach—right on main A4. Outskirts Maidenhead. Taplow station 4 mins. London branch (more than equal selection now that winter's here), 80, Oxford Street (Corner Rathbone Place), W.1. Tel.: Langham 5606-7. [0099

NEW "Statesman," £1,065. Other Berkeleys from £269/10/-. New Glider 4-berth £395/10/-, and 2-berth, £212. Safari, £395. Towing. Hire purchase. Mantles Garages, Ltd., Biggleswade. Tel. 2113. [0367

A MESSAGE for home-hunters. Ferraris of London, the home-maker, understands your problems! He has under one roof a second-to-none selection of the most-wanted caravans, is full of ideas for saving money and space, and has for immediate vacant possession your ideal home—just right for style, size and price. Send today for your free copy of latest illustrated brochure to:

F. O. C. CARAVAN CENTRE, 200-220, Cricklewood Broadway, Edgware Rd., London, N.W.2. Tel.: Gladstone 2234. Open daily 8.30-6 p.m.; Sundays 11-4 p.m. [0307

HAVE you seen this one? The 22ft. Homestead, £537. Cheapest mobile home in Britain! 4 rooms, end kitchen, separate end bedroom, 2 single beds, foldaway double bed, toilet, lounge panelled in oak, coal fire, etc. 30 others on view from £175. All guaranteed. Liberal H.P. Assistance with sites. Stafford & Co., Caravan Specialists, Bus Terminus, Kirkheaton, Huddersfield. Tel. 4001 and 3057. Always open. [7184

CLOTHING

R.A.F. and R.N. officers' uniforms purchased; large selection of R.A.F. officers' kit for sale, new and reconditioned.—Fisher's Service Outfitters, 86-88, Wellington St., Woolwich. Tel.: Woolwich 1055. [0567

CLUBS

REDHILL FLYING CLUB, Redhill Aerodrome, Surrey for instruction. Nutfield Ridge 2245-3234. [0348

HERTS AND ESSEX AERO CLUB, Broxbourne Aerodrome, Nazeing, Essex. M.A.C. approved 40-hour course; solo flying from 30/- per hour; residential; trial lessons 36/-; train from Liverpool St., or Green Line Coach 715.—Tel.: Hoddesdon 2455, 3401, 3705. [0226

PLYMOUTH AND DISTRICT AERO CLUB for Auster and Tiger Moth flying instruction; dual and solo at £3 per hour, reducing to less than £2 per hour for solo flying on "Fly Yourself Hire" basis; flying instructors courses and M.C.A. approved course for private pilot's licence. Tel.: Plymouth 72753. [0341

CONSULTANTS

WING COMMANDER R. H. STOCKEN, F.R.Ae.S., Eagle House, 109, Jermyn St., London, S.W.1. Tel.: Whitehall 8863. [0419

HOTELS AND ACCOMMODATION

ROYAL OAK HOTEL, Keswick-on-Derwentwater, heart of English Lake District, offers restful holiday to Air Force personnel; first-class accommodation at reasonable charges. [0414

INSURANCE

ALL types of aircraft insurance and personal accident cover.—Apply to J. W. T. Amey, Messrs. R. J. Moffat and Co., Percy House, 796, High Rd., Tottenham, N.17. Tel.: Tottenham 3003-4-5. [0584

PACKING AND SHIPPING

R. AND J. PARKS, Ltd., 143-9, Fenchurch St., E.C.2. Tel.: Mansion House 3083. Official packers and shippers to the aircraft industry. [0012

TIME RECORDERS

TIME recorders service rental. Tel.: Hop. 2239. Time Recorder Supply and Maintenance Co., Ltd., 157-159, Borough High Street, S.E.1. [6413

TUITION

DUAL and solo Austers, M.C.A. approved. Weekdays 45/6; week-ends, 51/6. Tel.: Elstree 3070. [0702

SOUTHEND MUNICIPAL FLYING SCHOOL, Southend-on-Sea, Essex.

TEL.: Rochford 56204. Comprehensive flying training. Private and commercial licences from £3 an hour, on contract from £2 per hour. Hire of Auster aircraft. No entrance fee, no subscription. Write for full particulars. [6332

LEARN to fly for £24; instructors' licences and instrument flying for £5 an hour; night flying £3/10/- an hour; residence 4½ gns. weekly. Approved M.C.A. private pilot's licence course.—Wiltshire School of Flying, Ltd., Thruxton Aerodrome, Andover, Hants. [0263

A. F.R.Ae.S., A.R.B.Certs., A.M.I.Mech.E., etc., on "no pass, no fee" terms; over 95% successes. For details of exams. and courses in all branches of aeronautical work, navigation, mechanical eng., etc., write for 144-page handbook free.—B.I.E.T. (Dept. 702), 17, Stratford Place, London, W.1. [0707

SCHOOL OF NAVIGATION, University College, Wardsash, Southampton. Flight navigator's course £16/10/- for six months' tuition; pilot licences, £7/10/- to £13/10/- for six months' tuition; Link instruction; all approach systems, 10/- per hour or £3/10/- for ten hours; postal course; hall of residence. Tel.: Looks Heath 2161. [0657

AIRCRAFT & ANCILLARY SPARES

OVER ONE MILLION ITEMS IN STOCK

A.R.B. & A.I.D. APPROVED

Selections from our stocks

RADIO

Sockets	10A/404
Sockets	10H/320
Sockets	10H/774
Sockets, 8-pin	PL 152
Receiver, Telephone Head	10A/12401
Receiver, Telephone Head	10A/12443
Plug, 4-pin wall mounting	10H/391
Socket, 2-pole, type 453	10H/14207
Switch Unit, type 35A	10FB/581
Switch Unit, type 35A	10FB/366
Plug	10H/1917
Socket	10H/529
Condenser fixed, 400 V	110C/3354

AMERICAN INSTRUMENTS

Directional Gyro Indicator	AN 5735/1
16 Compass, magnetic	Type B
15-2K Altimeter	Type E
Indicator, Wheel and Flap Position	Type B DJ4
Regulator, Suction Flap	EA 51064
Transmitter, Electric Tank Gauge	EA/65/141
Transmitter, Liquid Level	Type TJ 13
Gauge, Hydraulic Pressure	AN 5771/4
Altimeter type C 12	671/BK/010
Type B16 Compass, magnetic	1818/4/8
Indicator, Remote Magnetic Compass	AN 5730/2A
Air Temperature	Type CB
Gauge, Cylinder Temperature	Type B9
Gauge, Temperature	6007/3B/7A
Gauge, Manifold Pressure	6007/1E/7A
Gauge, Manifold Pressure	AN 5770/2
Indicator, Wheel flux position	8 DJ 17A
Indicator, Carburettor Temperature	94/27/997
Indicator, Fuel	94/27737
Indicator, Turn and Bank	A11
Indicator, Oil Pressure	94/27934/A
Indicator, Flap position	8DJ/1

AIRCRAFT, RADIO, ELECTRICAL, ETC. OVERHAUL, INSTALLATION AND MODIFICATIONS

All enquiries to:—

AVIATION TRADERS LTD.

SOUTHEND AIRPORT

SOUTHEND-ON-SEA

ESSEX

Tel: ROCHFORD 56491 (3 lines)

HAVE YOU OUR CATALOGUES?

H.O. 78 BUCKINGHAM GATE LONDON, S.W.1

Tel.: WHI 0056 (5 lines)

TUITION

COLLEGE OF AERONAUTICAL & AUTOMOBILE ENGINEERING, Chelsea and Redhill Aerodrome. Diploma courses in aeronautical engineering combine full day workshop and technical training with coaching for R.Ae.S. Associate Fellowship examination. Parts 1 and 2, aircraft engineers' licences, etc., in preparation for executive positions. Syllabus from the College Secretary, Sydney Street, Chelsea, S.W.3. Tel.: Flaxman 0021. [0019

SITUATIONS VACANT

THE DE HAVILLAND AIRCRAFT CO. LTD.

HAVE VACANCIES FOR

SENIOR DESIGN AND INTERMEDIATE DRAUGHTSMEN

(PREFERABLY WITH AIRCRAFT EXPERIENCE) IN THEIR HATFIELD AND LONDON (REGENT STREET) OFFICES

Applications, stating age, experience and salary required, to:—

CHIEF DRAUGHTSMAN,
THE DE HAVILLAND AIRCRAFT CO. LTD.
HATFIELD, HERTS. [0931

CITY OF MANCHESTER

FIRE OFFICER—AIRPORTS DEPARTMENT

APPLICATIONS are invited from suitably qualified persons for the above post. The salary and conditions of service will be in accordance with Grade 4 rising to Grade 5 of the National Scheme of Service Conditions for Miscellaneous Classes of Officers, i.e., £400 rising to £515 per annum. The commencing salary will be fixed according to the qualifications and experience of the person appointed.

Further details, together with a form of application, may be obtained from the Acting Airports Manager, Ringway Airport, Manchester, on receipt of a stamped addressed envelope, and should be returned to the same address by November 30th, 1951.

Canvassing is prohibited.

PHILIP B. DINGLE,
Town Clerk.

Town Hall,
Manchester, 2.
October 30th, 1951. [7201

EL AL—ISRAEL NATIONAL AIRLINES LTD.

Requires immediately a
CATERING MANAGER
with ability to train cabin personnel
and organise complete catering services.
Apply in the first instance, IN WRITING,
to
COMMERCIAL MANAGER,
EL AL—ISRAEL NATIONAL AIRLINES LTD.
265, REGENT STREET,
LONDON, W.1.
Personal canvassing will disqualify applicants. [7217

WESTLAND AIRCRAFT Ltd. have vacancies for the following:—

STRESSMEN, intermediate and senior.

DRAUGHTSMEN, intermediate and senior.

SPARES COMPILERS.

APPLY, stating age, qualifications, experience and salary required, to Personnel Officer, Westland Aircraft, Ltd., Yeovil, Somerset. [7078

THE DE HAVILLAND AIRCRAFT Co., Ltd., Hatfield, have the following vacancies:

SENIOR DESIGN DRAUGHTSMEN FOR SPECIAL INSTALLATIONS OF EQUIPMENT, INTERIOR LAY-OUTS AND FURNISHING OF CABINS

SENIOR DRAUGHTSMEN FOR FULL-SCALE LAY-OUT DEPARTMENT

TECHNICAL ILLUSTRATORS FOR MAINTENANCE MANUAL WORK

APPLY in writing, stating experience, age, and salary required, to Chief Draughtsman, the de Havilland Aircraft Co., Ltd., Hatfield, Herts. [7183

VICKERS-ARMSTRONGS, Ltd. (Aircraft Section), have vacancies at Hurn Airport for the following staff:—

DESIGN DRAUGHTSMEN
(aircraft experience preferable, but not essential).

AIRCRAFT STRESSMEN

JIG AND TOOL DRAUGHTSMEN
(aircraft experience preferable, but not essential).

APPLY, in writing, to the Employment Manager, Vickers-Armstrongs, Ltd. (Aircraft Section), Weybridge, Surrey. [7169

HANDLEY PAGE, Ltd., have vacancies for:

AERODYNAMICISTS of degree standard or with H.N.C. in aero subjects. Previous experience preferred.

WIND tunnel technicians of degree standard or with H.N.C. in aero subjects. Previous experience preferred.

STRESSMEN of degree standard or with H.N.C. in aero subjects. Previous experience preferred.

WEIGHTS control engineers with minimum qualifications of O.N.C. Previous experience preferred.

SENIOR design and intermediate draughtsmen, preferably with aircraft experience for Cricklewood and Radlett offices. Consideration will be given to applicants with experience in light structural or mechanical engineering. Possession of I.N.C. or H.N.C. (Mech. or Elect.) an advantage.

DRAUGHTSMEN with previous experience of full scale layout work or similar workshop practice.

TECHNICAL authors preferably with experience in the preparation of maintenance manuals, pilots' notes, technical specifications, etc.

TECHNICAL illustrators with previous experience in aircraft work. Write, stating age, qualifications and details of experience, to: Staff Officer, Handley Page, Ltd., Cricklewood, London, N.W.2. [7211

CHIEF jig and tool designer with experience in production development engineering for complete aircraft.—Apply in first instance with particulars of qualifications, experience, age, and salary required, to Box 4994. [7142

SITUATIONS VACANT

THE ENGLISH ELECTRIC CO, LTD., Luton, have the following vacancies on guided weapon projects:

RESEARCH engineer (Ref. 441B) for work on planning and analysis of supersonic flight tests. Applicants should have a degree, H.N.C. or equivalent qualification. Previous experience of stability and control work an advantage.

AERODYNAMICS engineer (Ref. 457A), with degree in aeronautical engineering, for work on supersonic aerodynamics. A good knowledge of mathematics, particularly calculus, is essential. Previous experience in industry not necessary.

STRUCTURAL engineer (Ref. 945) as assistant on structural research and design on supersonic project. H.N.C. or recognised diploma in appropriate subjects. Practical experience in design and stressing of aircraft structures an advantage.

APPLICATIONS, stating age, technical qualifications and experience, to Central Personnel Services, 24 Gillingham Street, London, S.W.1, quoting appropriate reference. [7194

DRAUGHTSMAN conversant lofting and development required for rubber press and allied tools.—Box 4922. [7180

LICENSED aircraft radio engineer required immediately. —Apply to Chief Engineer, Eagle Aviation, Luton, Airport, Beds. [0811

ASSISTANT air traffic controller with previous R.A.F. experience required for No. 6 Reserve Flying School, Syerston, Northants.—Apply to the Manager. [7183

TRACER. Modern light engineering company requires experienced lady tracer. Coventry area. Hostel accommodation available. Give full particulars of age, experience and salary.—Box 4989. [7208

SMALL firm requires sales manager for aircraft and spares, preferably with flying experience. Certain knowledge of engineering an advantage. Excellent opportunities. Box 4924. [7184

LICENSED radio engineer and radio mechanics at our base at Stansted Airport, Essex.—Apply by letter or telephone to the Senior Engineer, Stansted Airport, Essex. [0950

JIG and tool draughtsmen required, fully experienced. —Applications, in writing, to Personnel Manager, Percival Aircraft, Ltd., Luton Airport, Beds., stating age, experience and salary required. [0595

PERMANENT post, with good salary and conditions, is offered to a pilot holding Senior Commercial (Rapide Endorsement) and B.T Licence.—Apply: Jersey Aircraft, 4 The Parade, Jersey, Channel Islands. [7190

DESIGN and detail draughtsmen are required by British Messier, Ltd., for interesting work on the following: High-pressure hydraulic and electro-hydraulic components;

Hydraulic servos for aircraft and special projects;

Strength and functional test rigs for undercarriages and hydraulic components.

Previous experience on type of work not essential. Applicants should write, stating age, experience and salary required to Mr. R. J. Brown, Chief Draughtsman, British Messier, Ltd., Cheltenham Road East, Gloucester. [7159

WANTED, flight engineers for York aircraft. "A" and "C" to cover York aircraft essential.—Apply: Chief Engineer, Eagle Aviation, Ltd., Luton Airport, Luton, Beds. [0810

ASSISTANT Link Trainer instructor required for No. 6 Reserve Flying School, Syerston, Northants. Applicants must have had previous experience of operating the Link Trainer.—Apply to the Manager. [7182

APPLICATIONS are invited from design draughtsmen and stressmen, also technical assistants with combined design and performance experience for work on both reciprocating and gas turbine aero engines.

APPLICATIONS should state full particulars of experience and qualifications, and should be addressed to The Personnel Manager, The de Havilland Engine Co., Ltd., Stonegrove, Edgware, Middlesex. [7075

JIG and tool draughtsmen required. Previous aircraft experience not essential.—Apply Employment Manager, Vickers-Armstrongs, Ltd. (Aircraft Section), Weybridge, Surrey. [7204

AIRCRAFT ground engineer (preferably single) for New Zealand aerial work company. Prentice aircraft; DH.85, DH.94, Auster, Miles Aerovan. Licences required: "A," "B," and "C." Salary, £750 p.a., plus bonuses.—Apply: P.O. Box 169, Invercargill, New Zealand.

AQUILA AIRWAYS, Ltd., have vacancies for pilots. Minimum qualifications: commercial pilot's licence with instrument rating. Those with flying boat experience preferred, but training for conversion may be given to suitable landplane applicants.

SALARY scales: Second Officers, £815 by £30 to £935; First Officers, £1,036 by £30 to £1,306; Junior Captains, £1,335 by £50 to £1,535.

IMMEDIATE application, with full particulars of experience and licences held, to Operations Manager, 6 Curzon Place, W.1.

NOTE. Previous applicants will be contacted individually and need not re-apply. [7128

SCHEDULE clerks required (male) with experience in compiling M.o.S. spares schedules.—Applications, in writing, stating age, experience and salary required, to Personnel Manager, Percival Aircraft, Ltd., The Airport, Luton, Beds. [0596

TECHNICAL authors and illustrators required. Knowledge of M.o.S. procedure desirable.—Applications in writing, stating age, experience and salary required, to Personnel Manager, Percival Aircraft, Ltd., Luton Airport, Beds. [0594

AIRWORK, Ltd., Usworth Aerodrome, Co. Durham, require navigation instructors for air and ground duties. Desirable qualifications, staff navigator course and instructing experience. Applicants must be prepared to obtain a flight navigator's licence. [7149

SENIOR, intermediate and junior mechanical draughtsmen wanted for aircraft work. Previous aircraft experience not essential. Pension and life assurance scheme. — Apply: Employment Manager, Vickers-Armstrongs, Ltd. (Aircraft Section), Weybridge. [6920

CAMERA designer required by progressive company largely engaged on Ministry work. Modern factory in Somerset. Sound background experience essential. Hostel available and good prospects for the right man.—Send fullest details to Box 4935. [7178

STRESSMEN required for work on new projects, including guided missiles, preferably with experience on aircraft wing and fuselage stressing. Details of qualifications and experience should be sent to Box 4944, quoting reference F.14. [7188

LOFTSMEN, Junior, intermediate and senior—required for aircraft mould loft. Previous aircraft experience not essential.—Apply, Employment Manager, Vickers-Armstrongs, Ltd. (Aircraft Section), Weybridge, Surrey. [7203

EX-R.A.F. navigator with lecturing experience required to fill post of navigation instructor at a Reserve Flying School. Should be prepared to join the V.R. and to fly in the course of his duties, but a good instructor (non-flying) will be considered.—For further details, write Box 4985. [7176

Electrical Supplies

AN aeroplane is nothing more or less than an airborne mass of Electrical Equipment held together by the airframe and directed by the radio installation assisted in a small way by the pilot, and it is the aforesaid mass of electrical equipment about which concerns the whole of one department here at Aerocontacts.

WE can supply anything from the tiniest lug to the largest heavy duty engine-driven generators upon which every vital service in the aircraft depends. The complete range includes: press button switches; dimmer switches; ignition switches; magnetic relay switches; immersion switches; inertia switches; master switches; micro switches; fuses and fuse boxes; terminal blocks; voltage regulators; generators; inverters; accumulators; cable; starter motors; wind-driven generators; wind screen wiper motors; plugs; sockets; filaments; navigation lamps; warning lamps; identity lamps; Aldis lamps; landing lamps; recognition lamps; instrument lamps; Anglepoise lamps; suppressors; contact breakers, etc., etc., etc., and all are available from stock released to the requirements of either the Air Registration Board or the Aeronautical Inspection Directorate as required.

IN order to assist interested customers and purchasing officers, we have produced interim electrical lists in the ranges 5C/, 5L/, 5U/, and 5X/ as well as a composite list covering their American equivalents and these will happily be forwarded on request. Further lists are at present being compiled and applicants' names will be placed on our mailing list for all future issues. Our well-equipped Workshop is, of course, always available for the overhaul of clients' own gear for Certificate of Airworthiness and general maintenance and all orders will receive our most prompt attention.

AEROCONTACTS
Limited
GATWICK AIRPORT, HORLEY, SURREY
TELEPHONE HORLEY 1510 CABLES AEROCON HORLEY

SITUATIONS VACANT

PILOTS and radio operators required for permanent positions with charter company operating from Croydon Airport. B.A.L.P.A. and union rates paid. Reply, giving particulars of age, licences held, experience and present position.—Box 4982. [7174

SENIOR and junior weight engineers required. Interesting work on new projects. Permanent positions offered to suitable applicants.—Apply, stating age, experience, qualifications and salary required, to Chief Designer, Gloster Aircraft Co., Ltd., Witcombe, Glos. [0913

GLOSTER AIRCRAFT Co., Ltd., have vacancies for fully experienced aircraft structural and electrical draughtsmen.—Applications, in writing, stating age, experience and salary required, to Employment Officer, Gloster Aircraft Co., Ltd., Hucclecote, Glos. [0916

JIG and tool draughtsmen required for interesting work on design of equipment for development of new technique for welding high tensile steel.—Apply, stating age, experience and salary required to Mr. J. J. Wilson, Works Manager, British Messier, Ltd., Cheltenham Road East, Gloucester. [7140

VACANCIES for draughtsmen and stressmen exist in the Saunders-Roe Helicopter Division at Eastleigh, near Southampton.—Interested persons should write, stating age, experience, qualifications, salary required, etc., to the Personnel Officer, Saunders-Roe, Ltd., East Cowes, Isle of Wight. [7141

THE de Havilland Aircraft Co., Ltd., Airspeed Division, Christchurch Aerodrome, Hampshire, require a metallurgist. Work embracing control, material testing and kindred developments. Applicant with broad experience preferred.—Write, stating age, qualifications and salary required, to the Personnel Manager. [7202

DOWTY EQUIPMENT, Ltd., aircraft hydraulic engineers, Arle Court, Cheltenham, require stressmen. The factory is ideally situated and the environments and working conditions are excellent. Pension scheme, five-day week.—Write Personnel Manager, stating age, qualifications and salary expected. [7093

ASSISTANT required for technicians dept. by Coventry engineering firm engaged on production of aircraft accessories. Must have sound knowledge of advanced mathematics, as duties will include stress calculations etc.—Apply, stating age, education, experience and salary required to Box 4931. [7194

DESIGNER draughtsman with comprehensive experience in light engineering. Knowledge of hydraulics an advantage. Good prospects. Salary according to qualifications. South Midlands area. Assistance given with accommodation. State age, experience and salary, to Box 4987. [7206

APPLICATIONS are invited from senior and intermediate design draughtsmen; experience of aero engine design, desirable but not essential.—Please write stating age and giving details of previous experience in chronological order to the Personnel Officer, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex. [0449

BOULTON PAUL AIRCRAFT Ltd., Pendeford, Wolverhampton, require senior aerodynamicists for a variety of work on new aircraft products.—Applicants please state qualifications and experience and salary desired. Assistance in finding initial accommodation assured. [7134

AIRCRAFT DRAUGHTSMAN with mechanical experience required for experimental and development work.—Apply, stating age, experience and salary required, A.E.S.D. rates and upwards, to Chief Draughtsman, M.L. Aviation Co., Ltd., 4 White Waltham, Aerodrome, Berks. [7086

ONE male test laboratory assistant required. National Certificate standard and preferably 2-3 years' experience on design and analysis of mechanical tests.—Applications in writing, stating age, experience and salary required, to Personnel Manager, Percival Aircraft, Ltd., The Airport, Luton, Beds. [0597

SIX experienced aircraft senior draughtsmen are urgently required for interesting programme of development work. Excellent conditions and attractive rates for the right men.—Write to the Chief Designer, Helliwells, Ltd., Walsall Airport, for interview, giving full details of age and experience. [7085

DRAUGHTSMEN, senior and junior, jig and tool draughtsmen required for work on interesting and varied projects. Good prospects, pension scheme.—Full details in writing of experience, etc., to the Personnel Manager, The Fairey Aviation Co., Ltd., Hayes, Middx., quoting reference PD/A1. [7197

H. M. HOBSON, Ltd., invite applications for positions in the drawing office as follows: designers, detail and production draughtsmen, checkers, stressmen. The work is concerned with interesting projects connected with fuel metering equipment and hydraulic flying controls for aircraft.—Hobson Works, Fordhouses, Wolverhampton. [0459

AIRCRAFT fitter assemblers required by de Havilland Aircraft Co., Hatfield, offering good working conditions, modern equipment, opportunities for advancement. Superannuation scheme, sports club, etc.—Apply by telephone: Hatfield 2345, in person, or by letter addressed to Personnel Manager. [0909

PRESS tool designers and jig designers are required by large engineering company in the Southampton area. Applications are invited from men with the necessary tool room and draughting experience. High salary and good prospects for men with required ability.—Write Box K311, A.K. Advertising, 212a, Shaftesbury Avenue, W.C.2. [7216

CHIEF progress engineer required for firm engaged in construction of aircraft components. Applicant must have good technical background and previous experience. —Apply to Works Manager, King Aircraft Corporation, Fifth Street, Montrose Ave., Hillington, Glasgow, S.W.2, stating age, experience and salary required. [7214

INTERMEDIATE and senior draughtsmen required for experimental and development work of an interesting nature. Aircraft experience desirable but not essential. Good salaries, prospects and conditions of employment.—Write, stating experience, qualifications and salary required, to Personnel Manager, Flight Refuelling, Ltd., Tarrant Rushton Airfield, Nr. Blandford, Dorset. [7212

JIG and tool draughtsman required for firm manufacturing aircraft components. A man of wide experience with good shop background, capable of working with minimum supervision. Five-day week, pay according to experience.—Apply to Works Manager, King Aircraft Corporation, Fifth Street, Montrose Ave., Hillington, Glasgow, S.W.2. [7215

ARDTFT stressmen required immediately. Must hold a B.Sc. in engineering or equivalent. Experience on stressing aircraft structures desirable, but applicants without experience will be considered.—Apply in first instance, giving full details of age, experience, etc., to Personnel Manager, Scottish Aviation, Ltd., Prestwick Airport, Ayrshire. [7136

CHIEF technician with 1st- or 2nd-class Honours degree in engineering or mathematics required, age 30-40, salary £1,000 to £1,500 according to experience. Must have responsible experience in aircraft stress office work and in dealing with other technical problems associated with aircraft design. Successful applicant will be responsible for stress office and technical office and generally for the study of the performance of airframe components and the investigation of associated problems.—Box 4932. [7130

ROLLASON ENGINES LTD. CROYDON AIRPORT
Tel.: CRO 5151/4. *Cable:* ROLLAIR, CROYDON

SPECIALISTS IN

OVERHAUL, REPAIR AND MODIFICATION OF THE D.H. GIPSY RANGE OF AERO ENGINES

SITUATIONS VACANT

SALARY £800 to £1,200 a year according to qualifications offered for electrical designer, aged 30-40, required with 1st- or 2nd-class Honours degree to be responsible for the control of a department developing and exploiting electrically operated valves and other light electrical equipment for aircraft and industrial purposes. Experience of servo controls an advantage.—Box 4923. [7198

DRAUGHTSMAN, jig and tool, with practical experience in toolroom and production shops, required by manufacturer of automobile and aircraft accessories in Midlands. Good technical qualifications essential. Single accommodation available. Salary according to individual ability. Give details of experience, age and salary required.—Box 4988. [7207

BRITISH EUROPEAN AIRWAYS have vacancies at Northolt for link trainer instructors, with R.A.F. category "A" qualifications and preferably with up-to-date knowledge and experience of instrument approach procedures, including airways system. Commencing salary £815 p.a.—Applications to Personnel Officer, Flight Operations Dept., B.E.A., Ruislip, Middlesex. [7197

THE GLOSTER AIRCRAFT Co. requires senior and intermediate stressmen to work on designs and projects of advanced interest. Excellent prospects of advancement for sound and energetic men.—Apply, in the first instance, giving full particulars of technical qualifications, age, experience and salary required, to The Chief Designer, Gloster Aircraft Co., Ltd., Hucclecote, Glos. [7011

SUPERSONIC tunnel technicians required by aircraft firm in the Midlands, for construction and operation of a 7,700-p.s. supersonic wind tunnel. Vacancies exist for aerodynamicists, draughtsmen-designers and mechanical engineers. A degree in engineering would be preferred (Higher National in the case of draughtsmen-designers).—Apply, stating age, experience and qualifications, to Box 4930. [7195

STRESS engineers required by progressive firm in the Midlands for the stress analysis of new rocket aircraft projects. The positions offer exceptional opportunities of entering a new expanding branch of aviation and have good prospects. Applicants should have experience of stressing either of aircraft or engines or civil structures. A degree in engineering would be preferred but not essential qualification. The Company has good welfare and social facilities.—Apply, stating age, experience, to Box 4926. [7187

REQUIRED by major oil company for service in British Borneo, aircraft radio operator up to approximately 35 years of age, single or married. Must have first-class flight radio telegraphy operator's licence. Permanent career, initial contract three years with local leave and three months paid leave U.K. at end of each contract. Outfit allowance. Pension scheme. Travelling expenses paid for interview in London.—Please write, giving full details, to Box Z.Q.743, Deacon's Advertising, 36 Leadenhall Street, E.C.3. [7175

THE FAIREY AVIATION Co., Ltd., require stress analysts and aerodynamicists for a number of interesting and varied projects on fixed and rotary wing aircraft. Good salaries and promotion prospects. Superannuation scheme.—Apply in writing with full details of experience, etc., to the Personnel Manager, Hayes, Middlesex, quoting Reference TO/A3. [7156

AIR FORCE, Naval, civil and helicopter aircraft all under design and development at Percival Aircraft, Ltd. Applications are invited from senior and junior draughtsmen, and stressmen, for work on this interesting programme.—Write, giving details of experience and salary required to Personnel Manager, Percival Aircraft, Ltd., Luton Airport, Luton, Beds. [0595

HEAD storekeeper (male) required for firm engaged in construction of aircraft components. Applicant must have had previous experience in running finished parts and loose tools store. Sufficient technical background and organising ability essential.—Apply to Works Manager, King Aircraft Corporation, Fifth Street, Montrose Ave., Hillington, Glasgow, S.W.2, stating age, experience and salary required. [7213

BLACKBURN AND GENERAL AIRCRAFT, Ltd., have vacancies for senior and intermediate draughtsmen and stressmen with good engineering training and sound knowledge of and experience on all-metal aircraft. Also loftsmen or loftswomen with experience of aircraft work. —Applications, giving particulars of age, training, experience, etc., to the Personnel Superintendent, Brough, E. Yorks. [7129

FLIGHT test observers and aerodynamicists, capable of performance reduction and analysis and preparation of reports, required for programme of civil and Service aircraft development. Good prospects for keen workers.—Apply, giving full particulars of training, experience, age and salary required, to Personnel Manager, Percival Aircraft, Ltd., The Airport, Luton, Beds. [0592

TECHNICAL assistants, both junior and senior, required in mechanical engineering department for work of national importance in connection with development of gas turbine engines. Excellent prospects exist in sections dealing with rig test of engine components, vibration, static structure test and research in gears and bearings. —Apply: Reference No. 8, Armstrong Siddeley Motors, Ltd., Coventry. [0952

THE GLOSTER AIRCRAFT Co. requires the services of a number of servodynamicists, (a) for design and project work, and (b) for flight rest reduction. Opportunity exists for individuals to vary their experience within the Aerodynamics Department. Candidates with some years' experience preferred, but applications from juniors with sound mathematical ability will receive full consideration. —Apply, in the first instance, giving full particulars of age, experience and salary required, to The Chief Designer, Gloster Aircraft Co., Ltd., Hucclecote, Glos. [0913

BRITISH EUROPEAN AIRWAYS have vacancies for: (a) Pilots aged under 35, possessing Commercial Pilot's Licence, with instrument rating; commencing salary between £815 and £935 p.a., according to qualifications and experience; pension scheme. (b) Pilots aged under 35, but not qualified as above; to receive reduced salary during training period while obtaining above licences; pension scheme when qualified. (c) Pilots aged 35 and over, possessing at least Commercial Pilot's Licence, for temporary two-year appointments with possibility of extension. Commencing salary between £815 and £1,305 p.a., according to qualifications. Ineligible for pension scheme, but gratuity payable on expiry of appointment at rate of £300 for each year of service.—Requests for application form to Personnel Officer, Flight Operations Department, B.E.A., Ruislip, Middlesex. [7151

AERONAUTICAL and mechanical engineers are invited by the Ministry of Supply to apply for appointments in the experimental officer class, mainly in the Aerodynamics and Structures Departments at the Royal Aircraft Establishment, South Farnborough, Hants. Candidates should possess a Higher National Certificate or equivalent qualification in aeronautical or mechanical engineering but higher qualifications, e.g. a degree in engineering would be an advantage. Experience in experimental work, preferably in connection with aircraft design or testing is desirable. Salary will be assessed according to age, qualifications and experience within the ranges Senior Experimental Officer (minimum age 35) £742 to £980. Experimental Officer (minimum age 28) £545 to £895. Assistant Experimental Officer £280 (at age 17) to £505. Rates for women somewhat lower. The posts are unestablished.—Application forms obtainable from Ministry of Labour and National Service, Technical and Scientific Register (K), Almack House, 26, King Street, London, S.W.1, quoting C.572/51A. Closing date December 1st, 1951. [7210

MINISTRY OF SUPPLY requires senior engineers to encourage the adoption of improved production processes in the field of aircraft engineering. Qualifications: British, of British parentage; regular engineering apprenticeship and either be corporate members of one of the Institutions of Civil, Mechanical or Electrical Engineers or have exempting qualifications. Specialised knowledge in one of the following fields required: metal forming; production of raw materials (metallic and non-metallic); textiles, plastics, ceramics; welding technique; press work; instruments (mechanical and electrical); casting processes; material protection. Applicants are specially requested to give details of the type of work on which they have been employed. Salary: £1,250 to £1,450 p.a. Unestablished, periodical competitions for established pensionable posts.—Application forms from Ministry of Labour and National Service, Technical and Scientific Register (K), 26 King Street, London S.W.1, quoting Ref. C.649/51A. [7189

SITUATIONS WANTED

TWO pilots seek position; commercial and instrument rating.—Box 4925. [7188

DESIGNER, 25 years' experience, DH9A to Delta, seeks situation with scope, inside or out.—Box 4929 [7193

EXPERIENCED Link-trainer engineer, R.A.F. qualification A.I.D. (expired).—Mason, 1053, Warwick Rd., Birmingham, 27. [7191

AUSTER V (four-seater), commercial licensed pilot, and energetic engineer all require work during winter season. Prepared to do anything and go anywhere, separately or preferably together.—Write Box 4985. [7205

BOOKS, ETC.

"FLIGHT" back numbers, 1935, 36, 37 and 38. Perfect condition. What offers? Box 4928. [7192

AVAILABLE FOR IMMEDIATE DELIVERY EX STOCK

EVERSHED AND VIGNOLES BRIDGE MEGGERS

PRICE £35 COMPLETE WITH LEATHER CASE

Staravia

BLACKBUSHE AIRPORT

CAMBERLEY, SURREY

Tel: Camberley 1600

IN CIVIL AVIATION

— Hall-mark of the Competent Pilot —

SENIOR POSITION is vacant for **DESIGN SECTION LEADER**, servo mechanisms. Applicant must be of degree standard and have some experience in this work. The position is progressive, and is on interesting work of high national importance.

Write full details, age, qualifications, experience, to Box A.C. 66651, Samson Clarks, 57-61, Mortimer Street, London, W.1.

The . . .

British Air Line Pilots' Association

9-10 MARBLE ARCH, W.1

Tel.: AMBassador 1357

Membership open to all Commercial and Service pilots. For full details as to the objects and particulars of Membership please write to Secretary.

★ *Wanted for Cash*

STEEL BUILDINGS AND HANGARS

Send details to

UNDERWOOD CONSTRUCTION LTD.

Argall Works, Argall Ave., Leyton, E.10. *Tel: LEY 6968*

Jubilee

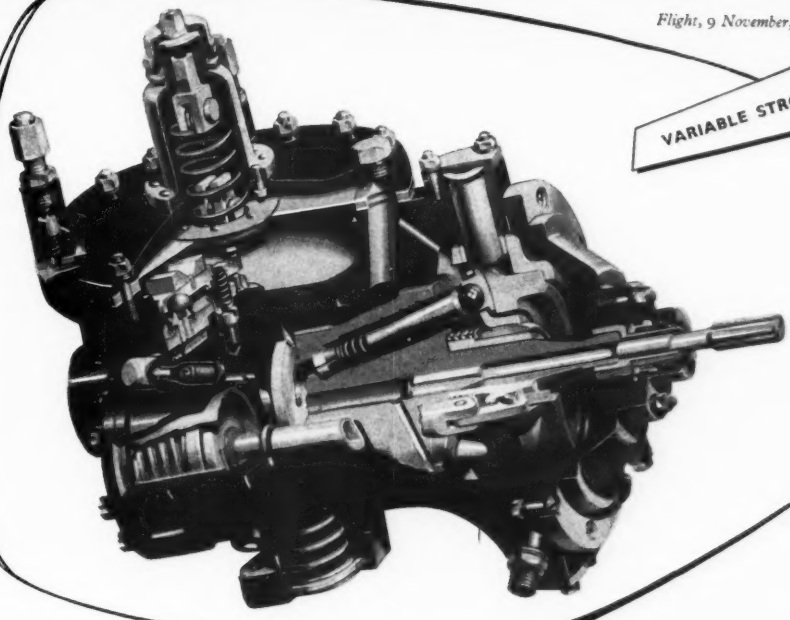
THE FINEST CLIP *in the world*

L. ROBINSON & CO., (GILLINGHAM) LTD.,

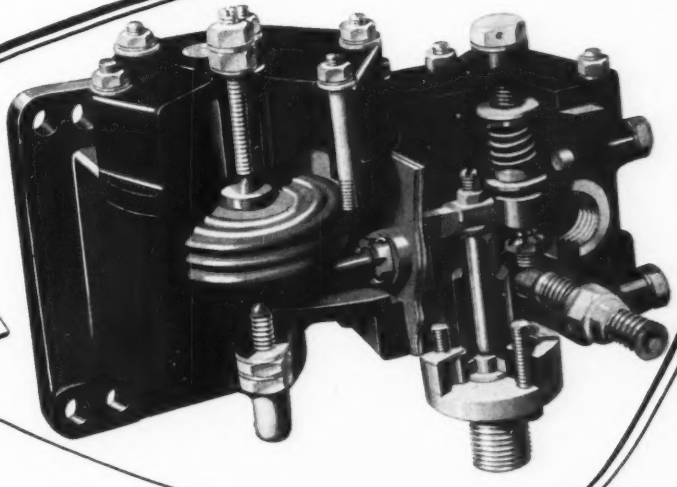
London Chambers GILLINGHAM KENT PHONE 5282

Printed in Great Britain for the Publishers, ILIFFE & SONS LTD., Dorset House, Stamford Street, London, S.E.1, by SUN PRINTERS LTD., London, and Watford, Herts. *Flight* can be obtained abroad from the following: AUSTRALIA AND NEW ZEALAND: Gordon & Gotch, Ltd. INDIA: A. H. Wheeler & Co. CANADA: The Wm. Dawson Subscription Service, Ltd.: Gordon & Gotch, Ltd. SOUTH AFRICA: Central News Agency, Ltd.; Wm. Dawson & Sons (S.A.), Ltd. UNITED STATES: The International News Co. Entered as Second Class Matter at the New York, U.S.A., Post Office.

VARIABLE STROKE FUEL PUMP



BAROMETRIC CONTROL

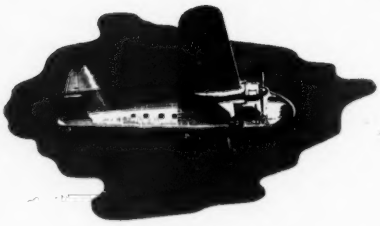


REMEMBER GENEROUSLY
SAT · NOV 10

The pump will deliver petrol at 750 g.p.h. (maximum). Its stroke is varied by a hydraulic servo which is responsive to any required signal, thus giving complete control with rapid response in output. The barometric control maintains correct pump delivery pressure in accordance with variation in altitude and forward speed.

FUEL AND COMBUSTION SYSTEMS FOR GAS TURBINE ENGINES

JOSEPH LUCAS (Gas Turbine Equipment) LIMITED, BIRMINGHAM AND BURNLEY, ENGLAND



. . . on which the sun never sets

The versatile "Bristol" Type 170 Freighter is to-day in regular service with Commonwealth air forces, scheduled air-lines and charter companies in a dozen different countries in all parts of the world. From Canada and the Argentine in the west to Australia and New Zealand in the east, Freighters are engaged on an unceasing round of operations on which the sun never sets.

THE Bristol AEROPLANE COMPANY LIMITED · ENGLAND